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THE U.T. FARMER

New Barn, Tennessee Experiment Station.

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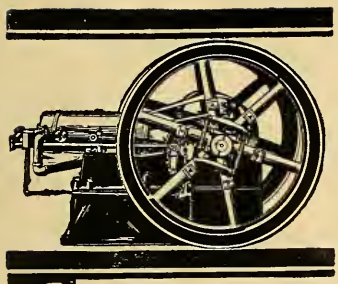

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"I may with justice" says the historian Rollin, "place agriculture at the head of the arts, as well with regard to its antiquity as to its utility. It may be said to be as ancient as the world, having taken birth in the terrestrial paradise itself, when Adam, newly come forth from the hands of his Creator, still possessed the precious but frail treasure of his innocence; God, having placed him in the Garden of Delights, commanded him to cultivate it."

THE U. T. FARMER

Vol. 6. OCTOBER, 1911. No. 1

AGRICULTURE IN THE PUBLIC SCHOOLS.

By C. E. ALLRED, '12.

There is no more timely subject for discussion at this time than that of elementary agriculture in the public schools. People all over the country are discussing it; it is being advocated by the President of the United States, the Secretary of Agriculture, the National Educational Association, the National Grange, Commissioners of Labor, railroad presidents, college presidents, superintendents of schools; in fact it is advocated by practically all who are interested in, and have studied the subject.

County fairs, state fairs, corn clubs, farmer's institute's and things of that character are of great educational value in their fields; but the teaching of farming in the public schools occupies a separate and more important field than any of these. For, after all, "as the twig is bent so the tree will grow" and by beginning early we can get the children interested in agriculture before they turn their minds to other things. The teachings will be in keeping with their dairy experiences and hence will be of more interest than any other study; and life in the country will have a charm for the child, and the country school a delightful place to spend the hours, when the child is interested in the work there.

After all, the object in all education is to help the student and society in some way. And what could be more helpful to the rural child than the study of the life history of the mosquito, or grasshopper, or cotton boll weevil, or the useful garden toad; the study of the interesting facts about the development of the corn ear or cucumber or the fig would be just as fascinating and much more helpful than the conjugation of Greek and Latin.

The most important question of American agriculture today is the improvement of country life. Much has already been done in that direction by rural free delivery, telephones, good roads and automobiles. But it remains for the great mass of farmers to be so educated that they can make their soils, their orchards and their flocks yield them the highest returns, and therefore the most comfort. For it is no longer easy for a poor farmer to make a comfortable living as it once was.

For many years there has been a movement of our young men from the farms of the South toward the cities, and also to the West. Let

the children learn agriculture when they are learning geography; interest them in the school and in their surroundings and instead of wanting to go to the city they will want to go to the Agricultural College or to farming. Farming is already becoming more attractive as a study because it is more attractive as an occupation than ever before.

Many ambitious boys leave the farm because they feel that there is no room for the development of their talents there; but by a few years study of agriculture they would see that business ability and training are just as highly rewarded in farming as in any other field and that there are perhaps more and greater problems awaiting solution in the agricultural field than in any other today. Finding his proper vocation is of course a very hard problem for every boy to solve; and I believe that thousands fail to choose farming simply because they do not understand what scientific farming really is.

It has always been a question as to how to get all the children to attend school and laws are being enacted to compel attendance; but would it not be much better to make the courses so interesting by introducing subjects in which the child delights, and the school surroundings so beautiful that the child would go of its own accord? Such a thing is being done in many communities today. It can be done in any community if the teacher or the patrons will only take the matter in hand and push it.

I firmly believe that agriculture should be required for every grade of teacher's certificate, and in many states it is so. Tennessee is yet much behind in this as in many other lines of educational development, but has recently been making rapid progress. We now have the long and short courses in agriculture at the State University; the Summer School of the South, three Normal Schools and many agricultural High Schools over the State in which teachers may be trained. Tuition in each one of these schools is free and each gives a good training to the future teacher of agriculture.

The farmers should see to it above all else that the teacher is a friend of agriculture and loses no good opportunity to show his or her pupils the advantages and opportunities of country life. And they should take an interest in all the operations of the school and always stand ready to do whatever the teacher asks of them, such as putting up prizes for corn, vegetable or poultry contests.

This subject has been investigated by the United States Department of Agriculture, and by the State Superintendents of many of the states. Each of these, after careful study, has laid out a course of study covering the whole period from the first grade on to the last year in High School. Either the Department of Agriculture or any of the State Superintendents will be glad to help any teacher who thinks of forming such a course. Good books too are now plentiful on the various subjects to be taught, the demand in recent years having been well answered.

In short, there is no longer any good reason why agriculture should not be taught in the public schools and

I believe it is only a question of a few years until it will be taught in every one. When we stop to consider that the children of today are the men of tomorrow; of what our duty to these children is; of the value to the nation that would be thus gained; of the long way we are behind Europe in farming methods; of the fact that the school is the hope of the nation; and that good citizenship is what schools should develop; then we cannot but see that the quicker we put agriculture in the public schools the better.

The South needs a wider diffusion of industrial intelligence as a foundation for the highest technical and intellectual success and this can only be acquired in connection with the general system of education into which it should enter as an integral part from the beginning. The latest philosophy of education re-enforces the demands of a productive industry by showing that that which fits a child best for his place in the world as a producer, tends to his own highest development mentally, physically and morally.

ADVANTAGES OF DEEP TILLAGE.

By PROF. J. C. PRIDMORE.

Because of varying conditions from place to place, it is a difficult matter to give anything but general rules on a subject of this nature, since the depth of plowing must depend largely upon the character of the soil, climate, and the crops to be grown. Yet, there are certain underlying principles, which if understood and carried out by the practical man, would enable him to increase his yields very materially.

The experience of this growing season during which the continued drouth cut short the crop yields, has taught the farmer that there is something of importance in profitable crop production besides the consideration of mere soil fertility. Even tho the soil be in a high state of cultivation, containing large amounts of available plant food, all the organic matter necessary to keep the soil in a good physical condition without a sufficient supply of water was available for the plant's growth, the crop yield will necessarily be reduced below the average. It is understood that the plant must take its food into the roots in the liquid form, and without an abundant supply of water to dissolve the soluble plant food and carry this in solution to the plant, the crops cannot get sufficient nourishment to enable them to grow. The crop yields this year will be determined by the amount of water which was supplied to the growing plants. In other words, because of the long dry spells, the water supply was the limiting factor in this year's crop production.

It often happens that there is sufficient rainfall throughout the growing season to enable the plants to make maximum growths, and give maximum yields. It frequently happens, too, that the yearly rainfall is sufficient to give good yields,

but it is unevenly distributed that is, it does not come at the proper time to be used by the plant to the best advantage. And, too often, when the rainfall does not come at the opportune time, from the plant's point of view, most of the water will be lost through surface drainage, percolation or excessive evaporation, but if it were stored in the subsoil, and kept there by surface cultivation, these losses would be avoided, and at the same time there would be enough to give good crop yields.

It follows then, that the practical farmer must have a reserve supply of soil water, from which to draw in time of continued drouth, in order to have the greatest assurance of an ample amount for the needs of the growing crop. This reserve supply is provided for in deep fall plowing.

While the depth of plowing should be determined to a large extent by the character of the soil, at the same time we are safe in saying that practically all the soils in this State are benefitted by being plowed to a depth of twelve or sixteen inches. This plowing should be done in the fall, to loosen up the subsoil so as to enable the winter rains to enter, where they can be conserved as if in a reservoir. Not only will the rainfall be conserved for future use, but the prevention of surface washing in another important step, taken at the same time. Shallow plowing will not allow the water, during heavy rains, to enter the soil. On the other hand, when shallow plowing is practiced, the water runs off the fields over the surface, causing many washes, frequently gullies, as it goes. Professor Buffum says that soil plowed three inches deep becomes saturated with seven-tenths of an inch rainfall, while nine inches of soil will absorb and hold over two inches rainfall at one time.

Aside from the fact that the rainfall is conserved, and surface washing prevented by deep plowing, the practice of deep tilling subjects more of the soil to the agencies of weathering, such as freezing thawing, and the action of the atmosphere and thereby deepens and improves the physical condition of the soil, and at the same time affords a better place for a stronghold for the root system of the succeeding crop.

As an illustration of the advantages of deep plowing, we might maintain the results of this practice on one of the fields at the Tennessee Experiment Station this year. The field was plowed sixteen inches deep last fall with the Spalding Deep Tillage Machine, during which process a large quantity of organic matter was turned under. The field was planted to a winter clover crop, which was turned in the spring. It was then planted to corn, and the enormous yield of one thousand bushels was expected from eight acres, notwithstanding the long drought. Deep fall plowing pays.

Go, make thy garden fair as thou canst,
Thou workest never alone;
Perchance he whose path is next to thine
Will see it, and mend his own.

—*Robert Collyer.*

PREPARING FOR WHEAT.

By H. P. OGDEN, '13.

A few words regarding wheat seeding may not be out of place at this time even though the time for sowing is at hand. It is too late for selecting wheat land or for very much in the way of preparation of a seed bed, yet I shall touch briefly on each point. Heavy clay soils or loams are superior to light gravelly or sandy types.

The preparation of the seed bed for wheat is of paramount importance deserving much more attention than is given by the majority of farmers. There is no best method of preparation, since different conditions demand different treatment. There are two general methods. One way is to plow the land some little time before seeding, and the other is to merely disk land that has had cultivated crops on it during the summer.

If the former method is used, the land should be plowed before August fifteenth, otherwise, unless the season is exceptionally rainy, the soil will be too dry for a good seed bed. In plowing for wheat much labor in the way of disking, rolling, dragging, etc., may be saved by waiting until the soil is in the correct condition in regard to moisture. The harrow or the drag and harrow should follow immediately after the plow, the same day. It pays to stop plowing each afternoon soon enough to harrow the day's plowing. Unless plowing is done early and when the ground is moist, the plowing should not be deeper than eight inches. Subsoiling for wheat is not advised only early in the summer. The soil should be disked occasionally to break the crust, conserve moisture and kill weeds.

It is not advisable to plow wheat land after removing summer crops as corn, cowpeas, soybeans, etc., which leave the soil in a loose condition. All that is needed under these conditions is to kill all weeds and cut up the trash, leaving the soil mellow and even. This is usually done by disking. If the soil is plowed, it often dries out too much causing a poor fall growth of the wheat and increases the danger of winter killing. This especially on land where cow peas or soy beans have been grown.

Which method are you going to use? Of course it is too late this fall to plow. The better method and average conditions depends upon your crop system. You must decide as to that, always bearing in mind two principles, namely, that wheat land must be moist and fairly compact, I do not mean hard, and secondly, it must be free from clods, weeds and trash. The method which will bring about these conditions the cheapest and most conveniently is the one to use. In any case it is always advisable to have the land ready, soon enough to settle and get one good rain if possible.

Wheat land should contain enough available plant food to give the wheat plants a good fall growth. This will do a great deal to prevent freezing out in the winter. On the other hand if the soil is too rich, the plants

make such a rank growth, that they often winter kill, or lodge. This crop responds very profitably to applications of fertilizers especially to phosphates and in some instances to nitrate of soda as a top dressing in the spring. But for wheat, barn yard manure is very hard to surpass when applied as top dressing during the winter. Bulletin No. 90, of the Tennessee Experiment Station gives some very interesting and instructive results of experiments with fertilizers for wheat carried on at the station farm and several farms near Knoxville. Bulletin No. 221 of the Ohio Experiment Station will also be found to contain a great deal along this line.

Poole wheat is the variety advocated by the Station as about the best adapted to good upland soil.

THE MEMOIRS OF A BEE.

By PENN W. WORDEN. '13.

In this world of industry, in this day when great things are to be accomplished, the little things of life are often pushed aside, deserted, and forgotten. Who today has time to give the unobtrusive little bee a moments thought? Seemingly no one has. And yet we bees play a part in commerce and live an exemplar life which might profit many to follow. Perhaps it is in part reparation for this neglect that fate has placed this pen in my hand, in order that before my five short weeks of life have run their length, I may write my life story:—"the short and simple annals" of a bee.

The first time I saw light was the day when, having broken the film like shell from about me, I lay a little white worm on the floor of a deep wax cell. Soon there came a bee and fed me with a thin porridge of honey and pollen. For six days first one bee and then another brought food to me in my little home. At the end of this time, having left me a goodly half cell of pollen they sealed the top over with a cap of wax. I now spun a silken cocoon about myself and went to sleep. Having napped for twelve days I awoke and finding myself transformed into a young worker bee, I bit my way through the prison door into the world beyond.

Outside everything was hurry and bustle. With the exception of the drones, who seemed to have nothing to do but get in every one else's way, each had her own work to attend to. I say "her work" for all the workers are females. After having made a meal of freshly gathered honey and taken a sun bath on the door sill of the hive, I was shown the art of mixing honey with pollen for feeding the young larva bees just hatched. The first several days of my life were spent in feeding and nourishing those young, white larvae into life. I was then given a most responsible position, that as nurse to a future queen. Much special attention and care was needed here. Her Majesty must have a cell of double size and of a certain conical shape, and must be fed on royal jelly, a much richer food than that fed to the worker larvae.

In the course of a few days the queen on whom I had waited was ushered forth from her cell with all due pomp. A gorgeous creature she was. She was much larger than us common mortals, and her tapering, leather colored abdomen was encircled with five golden bands, a coat of arms that showed her to be of the noblest strain of Italian bees. Even the queen cannot set herself up as a lady of leisure; so having fed well on honey and pollen, and having tested her wings with one or two short flights she flew away with one of the drones selected to be her consort. After the short honeymoon of a day she returned without her comrade and at once took up her portion of the hives work:—that of laying eggs. How well she was fitted for this work! Often in those early spring days she laid as many as two thousand eggs in twenty-four hours. Here we surely have the highest type of specialized labor.

At the time of the return of the queen, I was about a week old, and although a full-grown bee, I had yet to make my first forage for honey, the highest ambition of a worker. I had, it is ture, made frequent short flights just to start my wings and bathe in the sunlight before the hive, but never had I ventured into the wondrous field of white clover I could see just behind yonder green hedge. Now commenced my real life's work. A veteran gatherer led me far over the hills to a lilac bush and showed me how to drain each flower of its sweetness. Then we went to the white-clover field, the flower dearest of all to the bees. Next we tried to solve the problem of the red clover, the flower most reluctant in giving up its treasure. She showed me how to roll the little balls of pollen together and pack them safely in the pockets on my hind legs. And when we were heavy with our spoils she taught me to circle upward until I caught the scent of the home hive and then dart straight as a bullet to its entrance. Practice makes perfect! Every succeeding trip found me more efficient until in a day or so the novelty of the new work wore off and I settled down to the steady application of my life's work.

One day in the middle of the honey flow, our owner and a friend of his came to the hive; terrified us with a few puffs of smoke and took the roof off our home. Our hive was a simple wooden box with a water proof top and had holes on one side for entrances. Up to this time our honey cells and brood cells were hung side by side in odd shaped combs throughout the hive. This was very handy for feeding the young larvae; but the owner who wanted only the honey was not so well suited. He cut out several pieces of comb, but finding them to contain more eggs than honey his anger got the best of him. He threw down the honey and denounced bee keeping as a waste of time and a menace to religion. His friend smiled at him and as they walked away the friend was talking of a new variety of hive that had a brooding room for the queen and a separate compartment upstairs for the storage of honey.

The next day was hot and sultry. Not a breath of air entered the hive. No one felt like working for

our brood and honey store had been destroyed. Furthermore we were grown too many in numbers to live in so small a house. All morning long we hung in clusters about the hive entrance. Just as the dinner-bell in the top of the old oak was calling the farm hands to dinner, our queen came out and gave a few hurried commands. We reentered the hive; gorged ourselves on the remaining honey; and when Her Majesty slowly curled upward, the entire swarm of bees arose after her with one accord. The volume of tone from that myriad of wings was like the hum of a huge motor. Completely surrounding the queen we slowly moved over the hedge fence, across the field of clover and finally settled in one large cluster on a slender willow bough bending it low with our weight.

At the farm-house everything was in confusion. Alarmed by the roaring of our wings the farmer had rushed out and carefully watched our flight and its termination. In hot haste a messenger was sent off to town in a carriage. How hot it was in that pendant mass of bees. Only those on the outside had air. The rest of us were packed together, smotherd and covered with sticky honey. In the course of an hour the one sent on the errand returned bringing with him several white boxes. Having placed one of the boxes in the place of our old hive, the master came over to where we hung, cut the limb and carried us branch and all back home. With tenderest care he removed the queen from us and placed her in the new hive, relying on our fidelity to follow her.

What a difference between the new hive and our old one. In the new abode eight frames hung down vertically for us to build our brood combs on. Each frame was spaced just right to be most convenient for our access. Down the center of each was hung a sheet of wax foundation which saved us many hard days work of wax making:—the most detestable of labors. How fresh and clean everything was. No wonder it was that we took possession of our new home with pride and happiness.

When after a week's diligent labor we had built up several frames of strong brood, the owner came and placed another box, the counterpart of the one we already occupied, on top of the one in which we had started the brood. The two compartments were separated by a sheet of zinc, the perforations of which were large enough to allow entrance to workers but too small to admit the queen. This arrangement simplified matters immensely. All the surplus honey not needed for brood was taken above and stored on the frames there; and, since the queen had to stay below, it was kept free from eggs and larvae.

Not only were matters simplified for us, but it was much better for the owner. When we had filled several hives with honey he had only to drive us to the lower hive with a few puffs of smoke, lift out the frames, extract the honey, and then replace them. What a vast improvement over the other kind! They increased the amount and the quality of the honey. They saved his time and his patience;

and as he said "increased is chances of salvation."

The days are flying fast, and the day of my life is already in its twilight. The flow of honey is getting low. Already hundreds of idle drones have been stung to death or pushed outside to die of starvation. My wings are weakening and are getting ragged along their edges. What has my life accomplished? Perhaps I have gathered as much honey as you would use to sweeten a piece of bread or a hot flap jack if you like,—no more. Tomorrow I will go to the field to return no more; but my place will be taken before the sun goes down.

SILAGE FOR THE DAIRY HERD.

By C. F. JAMES, '14.

There is no longer any doubt as to the need of silage in the ration for milch cows. Dairymen are realizing this fact and many of them now give a prominent place to silage in their rations. While many do realize its importance, there are many who do not; and of those who do, there are many who do not get the best results because they do not feed it as it should be fed.

Milch cows should be fed other roughage in the shape of hay, cornstalks, etc. The quantities of silage fed should not exceed forty or, at the outside, fifty pounds per day per head. Where the keeping of milk is an important consideration 25 to 30 pounds daily is a maximum allowance. The silage should be given in one or two feeds daily, and always after milking, as the peculiar silage odor is apt to reappear in the milk.

Silage exerts a very beneficial influence on the secretion of milk. Where winter dairying is practiced, cows will usually drop considerably in milk toward spring if fed on dry feed, causing a loss of milk through the whole remaining portion of the lactation period. If silage is fed there will be no such marked decrease in the flow of milk before turning out to grass and the cows will be able to keep up well in milk throughout the year, or until they are dried up preparatory to calving. Silage has a similar effect on the milk secretion as green fodder on pasture, and if made from well-matured corn, so as not to contain an excessive amount of acid, is more like these feeds than any other at the disposal of the dairy farmer.

POINTERS FOR CORN GROWERS.

Do not fail to drain you soil;
It will pay you for you toil.
If clover is sickly, put on lime;
That will bring the soil to time.
Growing corn much water needs:
Keep a soil mulch; kill the weeds.
Heavy sods and good manure
Make the corn crop doubly sure.
This advice pray do not scorn;
Use some potash on you corn.

Professor Vivian, Ohio Station.

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Scientific; therefore practical

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EDITORIAL.

October is here and again the U. T. Farmer makes its appearance. The only important inovation will be the addition to the staff of four department editors. With this increase and with large increase in the number of students taking this course this year, we hope to make the paper much more interesting, instructive and more varied in its topics than heretofore.

Farmers are condemning commercial fertilizers more and more each year. This summer has given much dissatisfaction to those who have used fertilizer because it has been so dry. Many farmers are ruining their soil by its use. This should not be the case. Excellent results are obtained by its use and many soils require its application to increase or maintain their fertility.

Fertilizers must be used properly. Many farmers seem to think that fertilizers are supposed to make the crop, hence, they fall into careless methods of preparing the soil and caring for the crop. Others realize that there are right and wrong ways to use them but think the subject is too difficult for them to grasp. Such is not the case. To obtain profitable returns from the use of commercial fertilizers you must keep the soil well supplied with humus, plow deeply and well, and use those fertilizers needed by your soil and crops. This last problem, selecting the kind, is very important, requiring some study and individual experimenting. The principles underlying the subject of selection of fertilizer are much simpler than many farmers believe and will be discussed in the next issue of this paper.

Many farmers find this month among the busiest of the year. It is now harvest time and seed time combined. Many silos are yet to be filled although this work should be well-nigh completed by this time. More soy beans have been grown this year in this State than ever before and they are ready to cut for hay. If intended for hay, they should, when the pods are fairly well filled, before too many of the leaves turn yellow

and fall off. They require a long time to cure properly and for this reason are often cured in small frames.

Wheat is about the best crop to follow soy beans and soy beans are about the best to precede wheat or any crop.

STOCK JUDGING CONTEST AT STATE FAIR.

By C. E. ALLRED, '12.

This contest was conducted by Professors H. A. Morgan and C. A. Willson of the University of Tennessee, and under the following rules:

1. Any farmer's son under 25 years of age who has never graduated from an agricultural college and who has been a resident of this State for at least one year previous to the contest is eligible.

2. Any argicultural college student who has never engaged in a stock judging contest of interstate or international nature during any previous year is eligible.

3. No communication will be permitted between contestants during the contest.

4. Each contestant shall indicate in writing on a card provided for that purpose, his ranking of the animals in each class. These cards shall be handed to the Superintendent. Contestants shall be allowed 15 minutes for judging each class of animals. Each contestant shall appear singly before the judges and be allowed three minutes for stating his reasons for placing the animals in each class.

5. Five animals shall constitute a class.

Judges.

1 The judges will together look over each class of stock to be judged the animals first, second, third, and fourth and decide upon the essential reasons for placing the first above second, second above third, etc.

2. When a contestant appears before the committee, his card indicating his placing of the animals shall be handed to the judges. He shall then have three minutes to state his reasons for such placing. Sixty points shall constitute a perfect work for placing, and forty points shall constitute a perfect work for reasons.

3. Each judge shall grade separately the contestants and the average of the grades shall be the final grade on reasons.

The awards on horses were as follows:

	No. Points
1. Henry N. Snell, Brentwood, Tenn.	79.26
2. Wm. Claude Hix, Shelbyville, Tenn.	77.05
3. Louis Moore, Ashland City, Tenn.	75.72

Awards on Beef Judging.

1. J. L. Hinshaw, University	93.23
2. F. W. Gillespie, Gallatin, Tenn.	91.74
3. N. S. Hanson, University, Tenn.	84.98

Awards on Dairy Judging.

1. Geo. B. Woodard, Jr., Spring Hill, Tenn.	69.65
2. Chester Jones, Alexandria, Tenn.	68.16
3. Wm. Claude Hix, Shelbyville, Tenn.	66.00

Awards on Sheep Judging.

1. Geo. B. Woodard, Jr., Spring Hill, Tenn. 49.16
2. N. S. Hanson, University, Tenn. 49.00
3. A. C. Woodard, Spring Hill, Tenn. 47.06

Awards on Swine Judging.

1. Wm. Claude Hix, Shelbyville, Tenn. 91.66
2. Geo. B. Woodard, Jr., Spring Hill, Tenn. 91.23
3. F. W. Gillespie, Gallatin, Tenn. 91.32

Mr. Geo. B. Woodard, Jr., of Spring Hill, was also awarded a fine Jersy bull calf by Hon. Sam N. Warren of Spring Hill, Tenn., for making highest number of points in judging Jersey cows.

The ranking of the contestants in total number of points made was as follows:

		Total Points.
1.	Wm. Claude Hix	493.98
2.	Geo. B. Woodard, Jr.	459.11
3.	Henry N. Snell	444.44
4.	J. L. Hinshaw	428.67
5.	N. S. Hanson	428.59
6.	A. C. Woodard	401.46
7.	Louis Moore	400.72
8.	Chester Jones	357.31

Much interest was taken in the contest by stockmen and farmers in general. The contest will be held from year to year in the future with the idea of encouraging the farmer boy to be more conversant with livestock judging and to encourage an interest in better livestock throughout the State.

A GOOD ROTATION FOR TENNESSEE.

First year, corn, rye in the corn.

Second year, beans or peas in rows and cultivated.

Third year, wheat or grain, stubble immediately plowed for August seeding of red clover.

Fourth year, clover—second crop turned under and rye sown.

Fifth year, the land goes to corn and the rotation starts round again. Cotton may be substituted for corn in some sections of the State.

WHY PLOW DEEP.

1. Plants feed in the soil turned by the plow—the seed bed.

2. Deep plowing causes land to take in more moisture when it rains.

3. Deep plowing enables the land to hold moisture better.

4. Crops on deeply plowed land do not suffer so much from hot winds.

5. The land does not wash so bad when plowed deep.

HARVESTING AND STORING OF SWEET POTATOES.

A. S. ADSMOND, '12.

The time for harvesting potatoes depends on the method of marketing. When they are harvested and sold direct from the field, the work usually begins about the middle of August and continues until crop is sold or till about the first frost. With this method the yield is usually light, but the prices are generally higher. The potatoes that are kept in storage or for home use need not be dug till just before the first frost. In localities where frosts do not come till late, the potatoes may be left in the ground till the vines show a light tinge of yellow. At this stage they are mature and will stand handling better than at any other time.

Sweet potato foliage is easily affected by frost, but a slight freezing of the foliage will do no harm. If the vines become frozen before digging, they should be cut away before a rain or the potatoes dug, as the frozen sap will injure the tubers to an extent that they will decay in a short time. If wet weather prevents them from being dug immediately before or after frost and if cold weather continues it would be advisable to cover the hills with more soil, since where there is heavy yields the soil is often cracked or the ends of the potatoes projected out of the ground. If the potatoes are even slightly frozen they will soon decay.

There are various methods of harvesting sweet potatoes usually depending on the amount to be harvested. For small quantities the spading or potato fork is used. The long-handled potato hook is also handy for this purpose and this work may be greatly reduced by running a furrow on one side of the row with a one-horse turning plow. Where large quantities of potatoes are dug the work is usually accomplished by a sweet potato digger or a plow with a mold boom of iron rods that will not turn a furrow but will separate the potatoes from the soil. To this plow is also a couple of rolling coulters attached to the beams; one to go on each side of the row and cut the vines. For thorough digging it will be necessary to stir the soil after plowing to get the potatoes that may have been covered up. The machine used for digging Irish potatoes may also be used but it has a tendency to bruise the potatoes.

Sweet potatoes differ from Irish potatoes in that they can stand more sunlight; however they ought not to be exposed to very warm sunlight any length of time. It is very desirable that the soil should be dry and the weather warm for their harvesting in order to get all soil particles removed from them in the field by the least handling. It is also not advisable to leave them exposed upon the surface of the ground at night.

Sweet potatoes are unlike other products in that they require a warm dry atmosphere to keep well. The method of storing will also depend on the quantity to be stored. Of small quantities for home use, a good method is to pack the potatoes in barrels with each potato wrapped in paper or a sheet of paper between each layer of potatoes the potatoes being placed so they will not touch each other. These barrels may then

be placed in a loft above the kitchen where the atmosphere will be dry and not too cold. Another method is to place then in a pit of dry sand, but the sand must be kept dry. Sweet potatoes will not stand to be stored in bags or barrels without ventilation as Irish potatoes will.

Where large quantities of sweet potatoes are stored for winter market in the Southern States they are usually placed in out door pits and cellars, these storage places being located where the drainage is good. Then a little of the surface soil is thrown back in a circle to form a level bed 8 to 10 feet in diameter. Then two small diameter trenches may be dug about 6 x 6 making right angles at the center. These trenches can be covered with scrap boards then place a loosely nailed box about 4x4 erect in the center as high as potatoes and covering will go when complete. This is to permit air to enter the trenches and pass up through the loosely nailed box and into the potatoes around it. Then the bottom of the pit should be covered two or three inches with straw, leaves or fine straw.

Then place potatoes around center pipe in a conical shape and cover with straw, leaves or pine needles and soil to about five or six inches. The trench and flue is kept open until there is danger of frost when they should be closed at the ends, and opened again during warm periods.

SEED CORN.

MATTHEW RIZER, (Special).

October is here, and as we look out over the fields of mature corn, we are reminded that now is the time to get our seed for 1912. You may say it is too much and that you have no time, etc.

Corn is one of our oldest crops and should be in a very high stage of development, yet we find that exceedingly few farmers select their seed corn properly. Nevertheless it is an established fact that scientific methods of selection will produce marked results.

The proper preparation of our soil is the first requisite in making good corn of any kind but next in importance is the selection of seed. We say selection of seed because we believe the most plausible way of breeding is for the farmers to select a good variety of corn, then do his own breeding and selecting.

There are a number of reasons for this, firstly; corn secured from a distance has to become acclimated. We have to beware of the fake advertiser who has no better corn than is in our own field. It pays to buy seed corn in the ear, although the expense is somewhat greater, if we are buying from a distance.

The best method of selecting seed is to take a sack and go to the field. Do not wait until next spring after the corn has been mixed, eaten by rats and exposed to all kinds of weather and temperatures. Do it now.

In selecting from our crib we are often deceived when we select a large fine looking ear, for such growth may

be due to the exceptionally good environments that surrounded the stalk from which the ear came, where as under ordinary conditions the ear would be inferior. Our main object is to get the ear which has produced the greatest number of grains of corn under ordinary conditions. This can only be deserved in the field where we may consider surroundings.

The ears we select should, as nearly as possible, conform to the following type: shape, cylindrical; length from nine to twelve inches; circumference seven and five-tenths or eight inches. In other words the length should be to the circumference about as 4.3; butts and tips should be well filled; grains should be wedge shaped, of a uniform size, and set rigidly in straight rows on the cob. The corn should constitute nearly 90% of the ear's weight.

After selecting, the corn should be placed on shelves or tied on strings and kept in a dry place all winter.

We spend a great deal of time on pure bred animals why not on pure bred corn. The laws which govern the two are identical. From Station observations we find that under the same conditions pure bred corn yielded from five to forty bushels more per acre.

We farmers must awake to the great opportunities that lie within our grasp. How many men engaged in other kinds of business, would not quickly lay hold on anything that would increase ther gains, as seed corn breeding and selecting would increase the bank account of the farmer. Why, most men have to get a patent to protect their ideas, yet we poor farmers stand idly by and will not accept truths offered us for the asking. We must get busy and accept these opportunities or else we may expect to always follow the plow and a one horse plow at that.

PERMANENT PASTURES.

By W. M. BROWN, Short Course '10.

One of the greatest and most serious problems that the American farmer has to solve today is the maintenance of his soil fertility. This is a great issue, because much hinges upon it. For the solution of this problem there may be many methods suggested, but the one way, the way that nature in her wise provision laid out for us, is to keep livestock on the farm and feed as many of the products of the farm as possible to the stock, thereby retaining the greater part of the fertility on the farm where it should be.

On the majority of our Southern farms no system of animal husbandry is complete without the permanent pasture. What is a permanent pasture? It is a piece of ground where clovers or grasses or both are sown to stand off a number of years. It takes a considerable time to get a good sod of bluegrass or other good pasture grass, and those who have a portion of their land in a permanent pasture should not even entertain an idea of being led to plow it up on account of the high price of land.

On a majority of our Southern farms there is land which is well suited to a permanent pasture, but which would be too hilly or rocky to

grow other crops profitably. There may be some land on the farm too low and wet, or subject to periodical overflows, which will yield much greater returns in a permanent pasture. The writer knows a Middle Tennessee farmer who a few years ago plowed up a hillside well sodded to bluegrass for wheat, since he had become "crazy" on the wheat question. This man saw his mistake immediately, as the rains carried a good per cent. of the top soil into the streams below and scattered the sediment over some bottom between his field and the gulf of Mexico. He began to try to call back his bluegrass, which is so much prized by our Middle Tennessee farmers, with the result that in the course of three years the land was again producing its usual amount of pasturage.

There are many reasons why we would especially urge our farmers to get at least a portion of their land into a pasture. It, in one way, seems to have been a blessing in disguise that Tennessee and the South generally experienced a scarcity in farm labor for it has caused the farmer to look around for some way to utilize his land with less labor. He has found his solution in seeding down a considerable area and began to grow livestock to market these pastures.

We need the pastures to help balance the ration made of our corn crop. The young animals, the breeding stock, the dairy cows must have a variety of feed-stuff if they are to be kept thrifty and in a most profitable condition. Our high-priced land, high-priced labor and high-priced feed products of all kinds make it essential that we maintain and grow our stock cheaper by means of a balanced ration and by letting the animals do much of the harvesting. We believe that the permanent pasture is destined to be the greatest factor known in decreasing the cost of production of pork, mutton and beef. It is no longer profitable to produce pork on a whole corn ration, but it has been demonstrated by our experiment station that we can produce pork at around 4 cents per pound by substituting a rotation of pastures for a part of the corn diet. The permanent pasture, besides balancing the ration, extends the grazing season for over two months longer than otherwise would be had, it greatly decreases the labor and tends always to promote the health and vigor of the animals.

The majority of farmers will agree with me that permanent pastures will pay on a farm where there is considerable broken land which could scarcely be utilized otherwise, but they will say that they simply cannot see their way clear in putting land worth $100 per acre to pasture.

First, let us look to Great Britain, where the values of land are much greater than ours, and where the farmers find it highly profitable to keep a portion of the high-priced land seeded to a pasture for their livestock. Why should it not prove profitable for us, who have a cheaper land, and can find just as good markets for our products as the English farmer? In the second place, by keeping a large part of our farms seeded down, we are pursuing the course that Divine providence arranged for the maintenance of our soil fertility which will keep our land in a high state of production.

We have attempted to point out the many advantages of a system of pas-

tures, but for them to be profitable they must be cared for. As a general rule the farmer gives less attention to his pastures or grazing land than to any other department of the farm. We may judge the farmer by looking at his pastures, for if his pastures be in good condition all other divisions of the farm are more than likely to be in better condition. We are prone to be negligent with regard to our pastures as well as to many other features of our farm work. We feel safe in stating that fully 75 per cent. of our pastures are poorly kept. Some pastures are poorly drained, some have a poor stand of grass, others are overrun with weeds and bushes, and the land is not producing one-half of what it is capable of yielding under the proper management of the soil.

We want to especially urge farmers who have pastures in these conditions to begin to improve them.

We see thousands of acres of pasture land that needs better drainage. Why is it that more of our farmers do not begin to tile drain their pasture? This class of lands will yield to drainage just as quickly as any other type of land. Grass of the best quality, and the greatest amount of it, is found only in our best drained soils. Therefore, good drainage should be one of the first steps in this line of improvement.

We find bushes growing in a large per cent. of the pastures. They are taking out a great deal of the plant food and shading a considerable area of the land. I cannot see why any farmers with as much thrift as our Southern farmers are possessed of, does not take his hoe and axe and root out every bush. It will pay many fold.

Weeds are allowed to grow up and go to seed year after year, and continue to choke out the grass, and get a firmer hold upon the ground. The farmer should take his mower and go over his pasture once or twice during the summer, and allow no weeds to produce seed. By pursuing this course for a few years the pasture will practically be rid of weeds.

Other pasture lands have just about one-half of a stand of grass. We might assign as reasons for this, neglect, lack of plant food, and too close grazing encroachment from weeds and bushes. We should begin to remedy this at once, for a poor stand of grass is just as costly as a poor stand of corn. If we have bare spots that are poor it is a good practice to haul out enough manure to give them a thin coating and then take the disc harrow and prepare a good seedbed. This should be done in the early spring without plowing up the entire pasture, and clover, timothy, herd's grass and alsike clover sowed over these areas. These will soon cover the bare surfaces and give much pasturage where before nothing profitable grew.

Now, if we want to improve this great heritage, which I consider sacred, the soil left us by nature, we should put at least a certain area of our land to permanent pastures, for we have shown that they pay on land worth even $100 per acre, when properly cared for.

Do noble things,
Not dream them all day long—
And so make life, death, and that vast Forever
One grand sweet song.

HOG RAISING.

By R. L. SHOFNER, '13.

The hog has, without a doubt, done more for the American farmers, than any kind of livestock produced on the farms of this country. He feeds the peasants of Europe, the cotton pickers of the South, the workmen in the mines, the laborers of the shops, and the millionaire in his palace.

The hog is known over the entire world and is confined to no one part in particular. Even the ancients sacrificed one of these animals to the goddess of the harvest. He is said by the Irishman to be the gentleman that pays the rent. Some breeders advertise their herds on the mortgage lifters. One reason why the hog is a great source of profit is due in a great measure to its remarkable prolificness, and to the sort of raising. Several pigs could be kept in good condition on the amount of feed wasted by the horses, sheep, and cattle. The man who farms to the best advantage must make his feed stuffs pay all they possibly will, so would it not be a profit even to the small farmer to keep a few hogs to consume the waste, and make bacon which will bring excellent returns. It is safe to say that the hog is the most profitable animal raised on the farm. They can he sold on the market at a time of the year when the farmer has nothing else to put on the market, thereby bringing in money at a time when it is most needed.

Let us now consider the waste from the carcass of the hog. At the present time, the hog not only supplies the various products of his carcass in the eatable line, but also furnishes lubricating oils, brushes, combs, buttons, knife handles, and other ornaments of various kinds, and even the blood, a portion of the bone, and waste scraps of meat not otherwise used are manufactured by the packing houses into by-products to be used as feed among which is blood-meal, bone-meal, and a preparation known as tankage, which is one of the best protein feeds yet discovered, and is very valuable to combine with corn meal for the production of pork, when used in proper amounts it makes the best balanced ration that can be formed for finishing up hogs. When tankage is used in connection with corn or corn-meal, it should be used in the proportion of about 80% of corn or meal and 20% tankage.

In caring for our hogs we should provide clean houses and beds, and give them plenty of water for they do not perspire, and naturally suffer a great deal from heat. Some farmers provide a swimming pool through which fresh water is running all the time. In this case the hogs do not have to wallow in a mud hole These pools should be about 10 feet wide and 20 feet long and at a depth of 12 inches of cement with an outlet, thus affording a clean bath, and one that is economical for disinfecting.

It has been said that a hog can put ten bushels of feed into less space than a bushel measure and in so doing doubles the value of feed used. Corn, oats, barley, grass, clover, rape or any of the by-products loaned to a well bred hog is money at a high rate of interest.

CURING TOBACCO.

G. B. THACKSTON, '14.

The curing of tobacco is one of the most important steps in the preparation of a crop for market. Unless the crop is well cured the farmer's work goes for practically nothing for there is no demand for it.

If the tobacco has been transplanted early enough and well cultivated it will be ready to cut sometime between August 15 and September 1. Extra early tobacco will be ready to cut before this time and in some places it is later but this is a very good time. When cut the tobacco is placed on sticks about four feet long. For this purpose the stalk is split so that the plant may be placed astride the stick. Where the plants are large about six should be placed on a stick. Of course more may be put on if the plants are small but in no case should they be crowded.

In the larger districts the sticks are usually scattered through the field before the tobacco is cut and three cutters work together, cutting one row each. The middle one goes in front, pushes the sticks into the ground in a leaning position and places two plants on it. Each of the others then place two on, or more if needed, and so on. If the sun is shining the plants will be wilted in a short time and are ready to carry to the barn. This is best done an a wagon with a long frame made so the sticks may hang side by side.

Some of the smaller farmers follow a practice of placing the tobacco on scaffolds made of poles, to remain until it becomes yellow. This gets very good results but is hardly practicable for the larger growers. The main disadvantage is that after it becomes yellow on the scaffold it positively must not be allowed to get wet, and it is sometimes inconvenient to get it into the barn before a rain. Probably the best plan is to place it in the barn immediately after it is cut allowing plenty of room so that the air may circulate freely.

For air-cured tobacco an open shed with a good roof is an excellent place. It is left there until all parts of the leaves are completely cured, although it should occasionly be noticed to see that it is not crowded, which will result in house-burn, or the discoloration of the leaves, making it undesirable for the market.

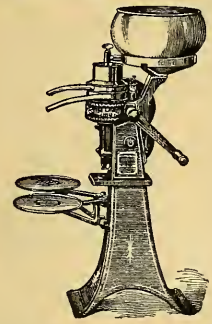
For fire-cured tobacco, a closed barn, practically air-tight with ventilators, is needed. The ventilators are kept open for about five days or until the tobacco has "yellowed," then they are closed and slow wood-fire started underneath the tobacco. After two or three days of slow firing hotter fires are started lasting until the curing is complete. However, the mistake should not be made of trying to cure the tobacco to quick by increasing the fires.

In either case, whether air-cured or fire-cured, the tobacco must be thoroughly cured and then left until it comes in "case," that is, until it absorbs enough moisture to be easily handled without shattering. This it usually does on damp, foggy days. When thoroughly in "case" it may be piled, covered with old quilts,

damp straw, etc., and kept that way for several days. However, care should be taken to see that it is "coming in" "case" when placed in a pile, instead of "going out," else it will become so dry that it cannot be easily handled.

The most common way of preparing tobacco for market is to strip the leaves from the stalk and tie them together in "hands." From six to eight leaves are placed in a "hand" and the butts tied together with another leaf. This process is known as "stripping." In some places the tobacco is stripped and the loose leaves packed in a paper-lined box ready for shipment. During the process of stripping the tobacco is also graded or "culled." There may be anywhere from two to six grades. The most common practice is to simply class it as leaf and lugs, the lugs being the light, trashy leaves found on the lower part of the stalk and any others that may be discolored. After it is stripped, if it is not placed in boxes, it may be packed into hogsheads containing about 1,500 lbs. and shipped to market.

During the whole process of curing the utmost care must be exercised if it is desirable to have tobacco of the best quality that will command the best price.



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This book is free to any reader of this paper. Write to The Zenner Disinfectant Company Lafayette Avenue, Detroit, Mich., for it.

I believe readers who send for it will have cause to be gratified that I have called this matter to their attention. Take my advice and send for it right away.—Editor.

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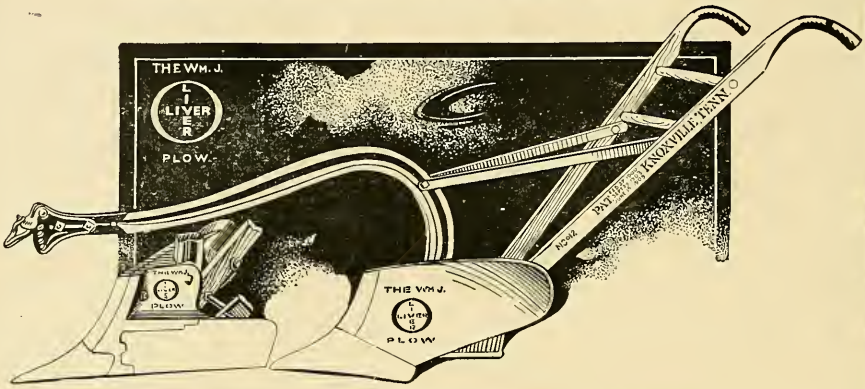

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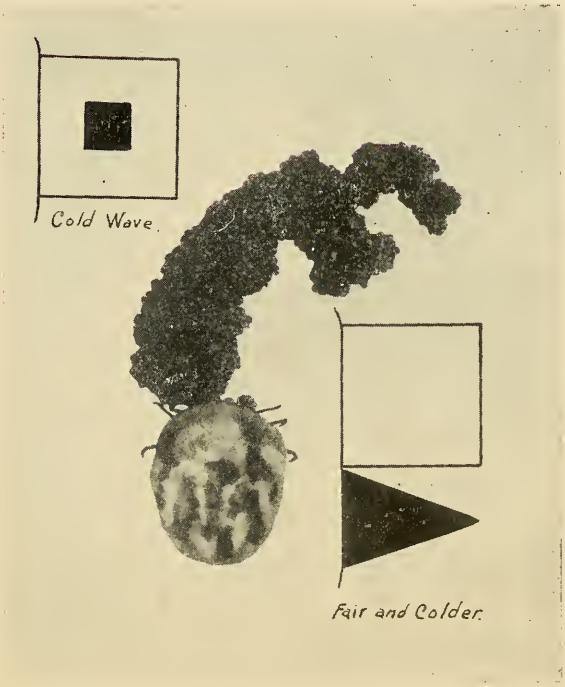

ADULT CATTLE FEVER TICK AND EGGS.

Vol. VI. NOVEMBER, 1911 No. 2

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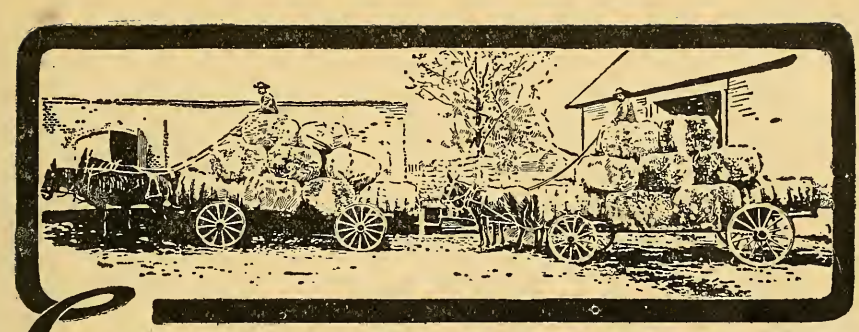

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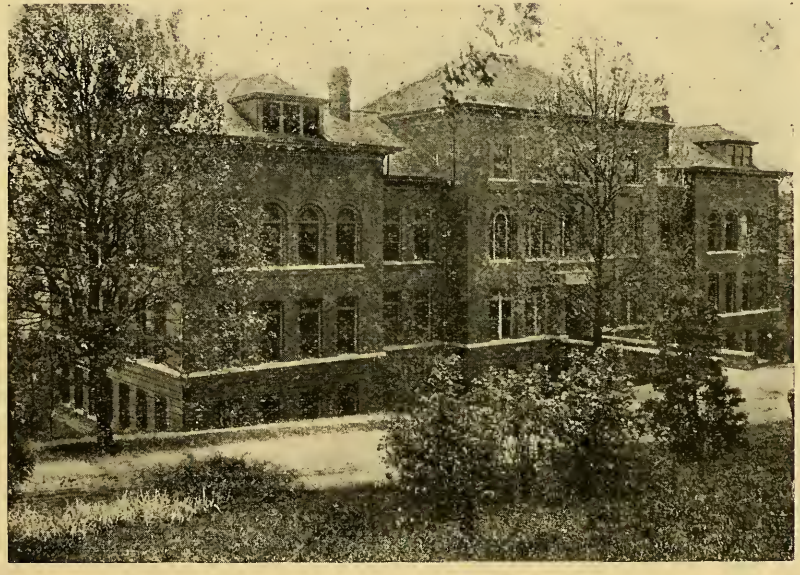

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THE U. T. FARMER

Vol. 6. NOVEMBER, 1911. No. 2

ALFALFA.

By GUY M. POWERS, '14.

The original home of alfalfa seems to have been southwest of Central Asia, but from there it has been carried to practically every agricultural district of the world. After having been introduced into several countries, the Spaniards brought it into Mexico and South America during the sixteenth century. From here it was carried northward into the Southern portion of the United States. In 1854, it was carried from Chile to San Francisco, then it rapidly spread over the irregated sections of the Western states. After proving very successful there, it gained distribution in every section of the United States where it was possible to be grown. It has been found a greater success in the limestone regions, than elsewhere.

There are several varieties of alfalfa. The Turkestan alfalfa was introduced into the United States in 1898. It thrives best in the semi-arid portions of the Great Plains and in the Columbia Basin. The sand lucern alfalfa is adapted to the colder and drier sections of the country, where it is proving the equal of any others tried. It proves most successful in the Northern states, where others are very likely to winterkill. The Grimm alfalfa was brought from Wertheim, Providence of Baden, Germany, in 1857, by a German named Grimm. It has proved most successful in Minnesota. As a drought-resistant, Dry-Land alfalfa is about equal to Turkestan alfalfa and sand lucern. Arabian alfalfa is proving a great success in the southwestern portion of the United States. It resumes its growth quickly after cutting and grows rapidly during growing season. It generally winterkills in all except the Southern and Southwestern States. Its rapid growth and longer growing season enables several more cuttings per season than does the ordinary alfalfa. The seed of this variety is not yet on market. The Peruvian alfalfa is similar to the Arabian alfalfa. The seed of this variety is not yet on market.

The different methods of preparation for raising alfalfa depend upon the climatic conditions and the section in which it is to be raised. Take any land, break deeply in the fall, and sow to rye, or wheat and vetch. In many cases it is necessary to fertilize the soil before sowing these crops. To fertilize this land, put 300 pounds of acid phosphate, 25 to 50 pounds of potash and 5 to 10 loads of barnyard manure per acre. Well-rotted barnyard manure is preferable, because there are fewer

weed seeds in it than in fresh manure. In March or April, before maturing, cut this crop off. But if the soil needs the organic matter, turn this crop under. Then it may be sown in peas, soya beans to be cut in July or August. This crop may be omitted and the soil summer fallowed,—that is cultivate the soil without any crop to destroy weeds. The purpose of this crop is to conserve the soil moisture, and kill weeds and grass. Alfalfa can't compete with weeds and grasses, hence a clean soil. If sown in soya beans or peas, the crop should be cut; then break and harrow, the deeper the better, in July. It should be harrowed once or twice more during July to kill the weed seeds that might germinate. After turning under any crop, it begins to decay and create acids. Having harrowed twice, put two tons of lime per acre to neutralize these acids and make the soil sweet, then harrow so as to thoroughly mix the lime with the soil. Having thus prepared your soil, you have an excellent bed for the seed, which is a very important factor in the production of this crop.

The time for seeding alfalfa varies in different section, but late summer seeding is best in the East and the South. The advantage, of sowing at this time, is that you have just taken off a coat of weeds and there will not be time for another stand during the summer. This gives it an opportunity to get a good start before winter begins, and enables the plant to make a rapid growth early in the following spring. This makes it better able to resist the weeds than if it had been sown in the fall or the previous spring. By planting at this season, You do not lose the use of your land for one year, but get a fair yield of hay the season after seeding.

The seeds may be planted with a drill or seeded broadcast with a hand seeder or wheelbarrow seeder, or by hand. It is best to sow half of the seed one way across the field and the other half at right angles to the line of first sowing. In Tennessee you should sow 30 pounds per acre. After sowing, with a light harrow, weeder, or brush, cover the seed about one inch deep.

If sown in late summer, alfalfa will require no treatment that autumn unless it reaches a height of more than 12 inches before cold weather. If this accurs, the plant should be clipped back, so that it will reach a height of 8 or 10 inches for winter. In this condition, it can better endure the cold weather and be in excellent growing condition when spring opens. The first cutting should be in the late spring. If weeds threaten to choke it out, or the plant begins to turn yellow, it may be necessary to cut it sometime other than the ideal time. The first cutting is usually left on the ground as mulch; but if the plant has turned yellow owing to some disease, it should be raked and removed. A little nitrate of soda, sprinkled over the soil, will invigorate the diseased plants. The plant usually requires no treatment the second season, except to cut the hay when about one-tenth in bloom, or better just as the basal or crown roots begin to appear. Alfalfa should not be pastured the first or second seasons, as the crowns are not well enough developed to with-

stand the effect of trampling. In subsequent seasons, it is not customary to give the field any special attention, as long as there is a perfect stand. Should the weeds prove troublesome, it is best to disc the alfalfa cutting. This loosens the soil aerates it which is of much value to the crop. By setting the discs nearly straight, the tap-roots are not injured but usually destroys most of the weeds. It is of great value to make an application of lime, either in the spring or after the first cutting, in sections where the soil requires liming.

The time to cut alfalfa is just as it is coming into bloom, or better as soon as the basal shoots begin to appear. These are to form the succeeding crop, and it is best to cut the crop off and give these shoots an early start. Experiments show that the highest feeding value is obtained by cutting in early bloom or when the basal shoots begin to appear. If the cutting is delayed until these shoots have reached any height, they are cut off and this will delay the succeeding crop. The number of cuttings depends upon the growing season and the variety. From thirty to forty days of good growing weather are usually required to produce an ample growth for a hay crop. About four-fifths of the alfalfa of the country is used for hay.

The ideal way of harvesting, is for it to reach the barn or feed lot with the least amount of hauling and exposure to the weather possible. Usually the mowers are started in the morning and the hay is raked into windrows the following day. As soon as the hay is sufficiently cured, it is cocked or stacked or baled direct from the windrows. It is cocked when the stems are "half dry." When the moisture can no longer be twisted out of a wisp of hay, it may be stacked. It should not be baled until the stems will break under a heavy twisting in the hand. Handle it in a careful manner so that the stem will retain all of its leaves possible. The leaf has the highest feed value of any other part of the plant. In other words 44 pounds of leaves contain as much protein as 100 pounds of stems. Analysis show the leaves are somewhat richer than wheat bran for feeding purposes. The exposure of alfalfa to rain damages it seriously.

The yield per acre varies according to the season and the section in which it is growing; but the average yield per acre is 4½ to 5 tons. It ranks among the highest grades of hay, in fact many believe it to be the superior hay.

When the frequent rains in the late spring prevent the hay from being properly cured, the first crop of alfalfa is sometimes ensilaged. The silo should be very deep so that the pressure would be sufficient to prevent spoiling.

Alfalfa hay has been found an excellent feed for dairy cows, and as a substitute for wheat bran, a less quantity produces as good results as does the bran, and is therefore cheaper. It is a valuable hay for sheep, horses, hogs, and beef cattle. Alfalfa is fed to hogs, mostly in the green state; and is fed to horses both in the green state and as hay. It is a most excellent

feed for young growing stock, especially horses, but be careful not to feed too much hay to colts, as it is likely to develop coarseness. Alfalfa meal is an excellent food for poultry. It is a fine plant for bees to feed upon, as it blooms so many times,—that is blooms each crop.

CAN A DAIRY FARM BE RENTED PROFITABLY?

By A. L. RUBIN, '14.

It is a well-managed farm that pays the owner fair wages and 5% interest on the investment while keeping up the fertility of the soil. Some farmers make considerably more than this. A much larger number make less.

The most profitable farms are usually those managed by the owner living on them. Should the owner tire of farming, move away and attempt to run it at a distance by hired labor, he generally finds the results very unsatisfactory and soon decides to sell or rent the farm.

There are many good reasons, however, for not selling the farm. Land is usually a very safe form of investment. It neither burns up nor is stolen away. It may appreciate enough in value as the country becomes more populated to pay interest on investment, even if no crops are grown. In any event, it will, if paid for, always furnish a home and an opportunity to earn a living. Therefore men part with farm land reluctantly.

Generally speaking, tenant farming is not a type to be encouraged in America. Small farms tilled by their owners are regarded as the ideal, because such farms tend to build up a conservative home-loving people. Cheap fertile farms are largely a matter of the past. The homesteads of the West are practically taken up. If a young man desires to go into farming in these days he requires considerable capital. It takes a long time, working out by the day or month, to acquire that capital, and good land is expensive. If he wishes to buy a farm, it usually takes all the money and credit at his command to buy the land alone.

After he has acquired the land, the struggle is only begun. Investigations have shown that in farming only about half the capital required, is invested in the land. The remainder is invested in buildings, fences, farm machinery, tools and live stock, sufficient cash being kept on hand for running expenses. Many a man makes the fatal mistake in buying a farm, by putting all his money in the land, then struggling the remainder of his life with insufficient means, trying to make the farm earn its equipment. O mere existence rather than a living is too often the result.

Should the same man let some one else furnish the farm and put his own money into the working and handling of it he would require less capital. He would be relieved of a large burden of debt, and with adequate equipment and cash on hand the farm would be run far more efficiently, and generally to his greater profit.

There is a place, then, in our present system of agriculture for tenant farming. There is a farm located in Southern Michigan, where both owner and tenant are receiving adequate compensation for their investment and services and where ample returns are made to the soil every year. This is a dairy farm of 120 acres of which 106 acres are tillable.

The agreement under which the business is carried on is this: Each man owns half the dairy herd. The manager furnishes the horses and ordinary farm implements such as plows, wagons and harrows. Machinery that belong permanently on the farm, such as engines and silage cutters, and the general expenses of running the place are paid for out of the individual receipts. After all the expenses are paid the net proceeds are divided equally.

On the 106 acres they grow almost enough roughage to feed 60 cows, 43 calves and yearlings, 2 bulls, and 9 horses. Concentrates, such as cotton-seed meal, oil meal and bran are purchased. It is the purpose of the owners to increase the dairy herd to 150 cows. In 1904, they began dairy operations with 17 cows and 4 horses. In six years the herd was increased to 30 head and to present number in the next seven.

They became dissatisfied with the ordinary dairy cows that were offered for sale, and so began to raise their own stock. Each milking is weighed and an accurate record is kept of the performance of each cow. The unprofitable ones they disposed of as soon as possible. Pure bred Guernsey bulls are used and only the heifers from the best producing cows are saved for the herd. In this way a herd has been developed, whose yearly record averages nearly 7,000 pounds of milk per cow. Some of the grade Guernsey heifers at three years of age have made better records than their dams ever did.

Most of the milk from the dairy is retailed in a nearby city. Two delivery wagons are used. There are several first-class dairies supplying this same market and competition is great. The financial success of this farm can not therefore be attributed to high prices received for milk. The usual rate is 5 cents a quart for milk delivered to the customer.

It is impossible to give an exact itemized statement of expenses and returns for the year. Hence the following table contains only round numbers:

Receipts for milk		$5,500
Miscellaneous receipts for hogs, calves, chickens, etc...		500
Total receipts		$6,000
Paid out for feed	$1,000	
Labor five regular hands	1,404	
Labor (day help) and other expenses	596	
Total expenses		$3,000
Net proceeds		$3,000

"He who plants the seed
Beneath the sod,
And waits to see it turn
Away the clod,
Believes in God,
His Country, and his fellowman."

—Ex.

SOIL BACTERIA.

By H. A. POWERS, '13.

Bacteria are the smallest of all living things, yet they render a service to man that is beyond measure. It is true that all of them are not beneficial, but the harmful ones form a small per cent of the whole number. The most important ones are those that live in the soil, and promote its fertility.

Soil bacteria must have favorable conditions to thrive, although they are found in most every part of the earth's surface. They will not do well if the soil is sour, or acid; too dry and too cool. A good supply of humus is desirable for them. Lime kills the sourness.

Soil bacteria are necessary to cause the decay of vegetable matter. This supplies humus to the soil and retains the plant foods better than burning would. They convert the nitrogen of the atmosphere into available plant food. Pure nitrogen, as an element can not be used by the plant, but it must go through a number of chemical processes first. There is very little made available through physical and chemical agencies. If it is manufactured by man the expense is very great, while that secured by bacteria is free. They are required by all legumes. They take nitrogen from the air in small bodies on the roots and then the plant uses this as food.

The legumes which include clovers, peas, beans, and other similar plants by means of tubercles, small knots on the roots, convert great quantities of nitrogen into plant food. It is estimated that some of them make as much as forty pounds of nitrogen per year. Through this means they secure a great portion of their supply of this element, if the soil is not unusually fertile. If the proper kind of bacteria are not present some members of this family will not thrive, hence we see that it is of the utmost importance that the soil be inoculated.

Different authorities disagree as to the value of inoculation, but alfalfa and the vetches require it, to thrive, if the crop is being grown on a field for the first time. The other legumes have been greatly benefitted by it in some instances. The reason why some of the more common ones, as peas and beans, do not require it, while alfalfa and some others do, is that the soil has already been inoculated by a previous crop, or some other source, since it would be very easily done by removing small quantities of soil from one field to the other. Bacteriologists have not yet been able to distinguish each of bacteria that is common to only one plant although there is difference as to the kind that are most beneficial to every group. Much is to be learned about them yet as it was only in 1886 that Helbrugel and Wilforth discovered them.

Soil inoculation may be accomplished in at least two ways. One is to remove a small quantity of the soil from a field which has the same crop on it that is going to be put on the new land. This is very expensive if the soil must be carried any distance, on account of the quantity. There is another disad-

vantage in that, some of the plant diseases may be brought along also. This method has given the best results. Another way is to secure a pure culture. This is put up in some vessel that will preserve it. It is then put in water and applied to the soil. The seed may have been soaked in it, previously, and dried. The latter means has not proved very successful. No attention should be given to commercial bacteria as they have almost invariably proved failures.

Recent investigations seem to prove that soil contains certain minute animals that are great enemies to bacteria. They are supposed to feed upon them and thus keep their numbers down. Partial sterilization of the soil, by which the very small animals were killed and part of the bacteria caused an increase in the amount of the latter, afterwards. This is explained by protozoans being killed and the bacteria remaining to multiply without any enemies to prey on them.

An effort is being made to cause them to live upon cereals, like corn and wheat, in the same way as on legumes that the farmer may secure a part of their mitrogen from the air.

ASH REQUIREMENTS OF ANIMALS.

By JUDD BROOKS, '12.

The importance of the ash constituents of feed stuffs has not been known until recent years. The subject is one to which the farmers and stockmen should pay special attention. It is one upon which the proper growth of all animals is based, and without careful attention, the necessary ash requirements of the rations are left out.

Investigators have worked out experiments with different animals, in order to find out if there were really any mineral elements of the ash of food necessary for the proper development of farm animals—Fourteen elements were found to be essential for animal growth. Calcium (lime) and phosphorus (phosphate) were found to be the most important among the fourteen. They are given their importance from the fact that the animal's skeleton is made largely from these elements (83%).

To show the great importance of mineral elements in the ash of feed stuffs, the Celebrated Scientist Forster, experimented on dogs with a diet composed of ash free from mineral elements, and they subsisted for only a few days. Lunnin then tried an experiment on mice. To one pen he fed a ration of sugar, which is almost free of mineral elements, and to another pen he fed a starving or no ration at all. The sugar fed mice died sooner than those fed upon a starving diet or no ration at all. This then shows that a food very deficient in mineral elements ends the life of an animal quicker than no food at all. Mineral elements are then very necessary for the proper growth of animal as well as for that of plants.

"Bunge" found that there is a definite relationship between the composition of milk and the rapidity of growth of young animals for which it served as good. The table below will show this relationship:

Species	Time in days for new-born animal to double its weight	100 Parts Contain			
		Protein	Ash	Calcium (Lime)	Phosphorus
Horse	60	2.0	0.4	0.086	.057
Cow	47	3.5	0.7	0.114	.87
Sheep	15	4.9	0.84	0.178	1.27
Dog	9	7.4	1.33	.321	.223
Rabbit	6	10.4	2.50	.636	.437

The above table indicates the necessity of a food very rich in protein and ash for the young growing animal. It will be noticed that the rabbit doubles its weight in six days while on the other hand, it takes the colt sixty days. It requires a milk or food containing six times as much ash and five times as much protein for a rabbit as it does for a colt.

It can clearly be seen how important a ration rich in mineral ash materials is for the cow or sow, from the fact that their young develop so rapidly. The young depend largely upon the mineral elements of the milk for their bone development. Cattle and hogs fed exclusively on a ration low in lime, phosphorus and the other essential mineral elements, become very poor and often malnutrition sets up. The animal begins to use the phosphorus and lime of their bones, in order to supply the milk with those elements upon which the development of the calf or pig are so dependent for bone and muscle development.

Voit, a German Scientist says, "growing animals whose bones are rapidly increasing in size suffer from a lack of lime and phosphorus sooner than grown animals." Young animals receiving a ration low in lime or phosphorus are soon attacked by rickets, the joints swelcoming crooked, the teeth remaining small and soft, and the animal finally becomes unable to walk. Pigs, because of their restricted diet, suffer more from insufficient amounts of lime and phosphorus, than do calves, colts and lambs, because they usually receive sufficient amounts of mineral elements in their hay and other foods.

The lime and phosphorus content of the feeds should be considered in all rations for live stock, straw, molasses, cereals and their by-products such as middlings, bran and shorts are low in lime, on the other hand, clovers, alfalfa, meadow grasses and leguminous grains, such as soybeans, peas and the like, are rich in lime. Straws, potatoes and molasses are low in phosphorus, while on the other hand, cereals, beans, peas, bran, middlings and shorts are high in phosphorus.

Since lime, phosphorus, and other mineral elements are so essential for animal development, it can be seen why a thorough knowledge of the different feed stuffs is so necessary. All feeds do not contain all the essential mineral elements of animal nutrition, and as a matter of fact, they must be supplemented by feeds rich in those principal elements (lime and phosphate) or by the use of raw rock phosphate or bone meal

in small quantities, for phosphorus, and tri calcium phosphate or lime water, for the lime in order to bring up the mineral requirements of the ration.

It can clearly be seen that the animal, to attain its proper development, should have mineral constituents sufficient to meet its body's demand. Therefore, we as husbandmen, should strive to become acquainted with the common feed stuffs, their composition, and the methods of computition of beloved ration. It means better live stock, better stock means more money in the state, a more wealthier state should mean better farms, better homes, better schools, and a better state.

The farmer toils thro' the seasons long
With the hot sun overhead.
His treasures he wrings from the fruitful earth
And often the world forgets his worth,
Tho' he gives the world its bread.
A myriad of foes are round about
To rob him of honest need—
But his hands tho' calloused and brown with toil,
Are ever as clean as his virgin soil
He grinds at the mill of greed.

TWO CALLS.

Luck tapped upon a cottage door,
A gentle, quiet tap;
And Laziness, who lounged within,
The cat upon his lap,
Stretched out his slippers to the fire
And gave a sleepy yawn;
"Oh, bother! let him knock again!"
He said; but Luck was gone.

Luck tapped again, more faintly still,
Upon another door,
Where Industry was hard at work,
Mending his cottage floor.
The door was opened wide at once;
"Come in!" the worker cried;
And Luck was taken by the hand
And firmly pulled inside.

He still is there—a wondrous guest
From out whose magic hand
Fortune flows fast—but Laziness
Can never understand
How Industry found such a friend;
"Luck never came my way,"
He sighs, and quite forgets the knock
Upon the door that day.

—Coleraine Constitution.

IN THE BOX STALL.

As a rainstorm makes things dreary,
I am far from feeling weary,
So to you I think I'll spin a little yarn.

For 'round here the main feature,
Is a dainty little creature,
In the cosy little box stall in the barn.

At my raincoat it is tugging,
At my trousers it is lugging,
For its little teethless mouth can do no harm.

In my pockets it is prying,
Then my shoestrings is untying,
In the cosy little box stall in the barn.

As I watch its stricks so cunning,
While 'round me it is running,
Seems to speak to me of "profits on the farm."

For I cannot help but knowing,
That into coin it's growing,
My colt within the box stall in the barn.

—Exchange.

THE U. T. FARMER

Scientific; therefore practical

Published Monthly by the Agricultural Club of the University of Tennessee.

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EDITORIAL.

Erosion is one of the greatest enemies to soil fertility. The type of erosion doing most damage in Tennessee, is that caused by running water.

During the fall and winter months, the rainfall for the state is very great. As much as 17 inches has been recorded in January. This means that a great deal of washing is done, and consequently, much fertility and soil are removed from our fields.

To prevent erosion, the soil may be plowed deep and subsoiled, when the fields are not too steep—here the water is taken up by the spongy soil and subsoil, therefore little erosion occurs.

Perhaps the best plan to prevent erosion, is to sow the field to some cover crop, such as crimson clover, barley, rye, oats, wheat or vetch. The time for sowing barley and crimson clover is passed, and therefore, rye, wheat or vetch may be sown to an advantage.

Oat and vetch, wheat and vetch, or rye and vetch, are either good combinations. These crops not only conserve the fertility of the soils by preventing erosion, but they may be used to an advantage for hog or sheep pasture. The combination contains the two essential classes of elements, the nitrogenous (cheese) and the carbohydrates (cracker) which constitute a good growing ration for hogs and sheep.

As it is getting late in the season, it is more advisable to seed rye at the rate of 2 bushels, and vetch at the rate of 20 pounds per acre. This mixture has been known to be grown successfully when seeded as late as December 1st.

There is no reason why the farms of Tennessee, be allowed to wash away when the methods of prevention are so easy and profitable.

Why plow? It loosens up the soil, exposes more of it to be acted upon by the sun, air and frost. Stubble, weeds, seeds, wild onions, and other field pests are buried, and changed to humus. The water holding capacity of the soil is increased, and rainfall can get into the plowed ground easier and faster.

On deep plowing a heavier rainfall can get in without run off water as would be the case with shallow plowing. The air holding capacity of the soil is increased and bacteria are more able to liberate plant food. Worms are more numerous, and the soil is ground finer by their action.

Do not take a wider furrow than the plow will cut. Thorough plowing always pays. It is a good idea to disc before plowing; this puts the ground in better shape for the plow.

There are still a large number of agricultural students who have not subscribed for the Farmer. Remember that the paper is yours as much as ours, and that without funds we can not put out a creditable paper. A college is judged, largely, by its publications; certainly no true agricultural student wants a poor paper to go out because of the lack of funds and good material to support it. Let us get together and put out a paper that no one can make "light" of. Let this be the most successful year of the Farmer's existance. We can do it, fellow-students, and be benefited by the effort.

It is gratifying, indeed, to know of the great strides being made by Tennessee in agriculture. At the present, a demonstration train, consisting of seven palace cars, is being run through East Tennessee. The train stops at all the stations along the Southern route, and lectures are given by Professors, Morgan, Keffer, Willson, Pridmore, Mr. Peck and others who are posted on the needs and requirements of Tennessee's agriculture. Many lessons may be gotten from those lectures for the simple fact that materials such as beef cattle, dairy cattle, farm crops, soils and many other things pertaining to the farm are at hand for demonstration. It is hoped that the farmers will congregate by the thousands to hear those lectures. Much may be learned, and the profits from such knowledge as is gotten there, when rightly applied should increase your wealth many times.

RATES AND DATES OF SEEDING FOR FARM AND GARDEN CROPS FOR THE STATE OF TENNESSEE.

By C. A. MOOERS.

How much seed to plant and when to plant it are questions often asked by professional farmers and gardeners as well as by amateurs. The major part of the data relating to general farm crops, as given in the table which follows, has been prepared from the records of the University of Tennessee Experiment Station at Knoxville. For the garden crops some of the leading Knoxville market gardeners were consulted and special thanks are due to Messrs. A. H. Dailey, A. J. McNutt, C. M. Emory and Paul Webb. That all of these well known gardeners would subscribe to the following table in every particular is doubtful. The fact is there are many conditions such as peculiarity of season, texture and fertility of soil, care in preparation of land, system

of cropping and various objects to be gained which modify both rate and date of planting. The information presented is therefore to be considered only as an attempt to give a trustworthy guide.

To make the data relating to time of seeding and of transplanting applicable throughout the State. Bulletin 87 of the Tennessee Experiment Station on the relation of the Weather Service to the Farmers of Tennessee by J. F. Voorhees, should be consulted. Charts III and IV of this bulletin are especially valuable in this connection and the proper changes, if any, for different localities can be made by inspection.

A—GENERAL FARM CROPS.

Crop	Rate of seeding per acre	Favorable dates of Seeding.	REMARKS
Alfalfa	20—30 lbs.	Aug. 15—Sept. 7	Not advisable to sow in spring.
Barley, winter	2—2½ bu.	Sept. 15—Oct. 7	May be sown last week in August for pasture. Spring barley of little value.
Broom Corn	3—4 lbs.	May 15—30	Standard—3½ ft. rows with 1 stalk every 3 in. Dwarf—3 ft. rows with 1 stalk every 2 in.
Buckwheat	36—48 lbs.	July 15—30	
Clover			
(1) Alsike	6—8 lbs.	Aug. 15—Sept. 7 also Mar. 1—15 or earlier.	
(2) Crimson	16—20 lbs.	July 15—Aug. 20	May be sown later under favorable conditions.
(3) Red	10—12 lbs.	Aug. 15—Sept. 15 also Mar. 1—15	
Corn	3—5 qts.	April 15—May 5	Often risked earlier. May be planted to middle of June.
Cotton	1½—2 bu.	May 1—10	An excessive quantity of seed used and plants chopped to the proper stand.
Cowpeas	1½—2 bu. broadcast ½ bu. in rows	May 20—June 20	Whips and New Era may be planted as late as July 7.
Grasses			
(1) Bermuda	8—20 lbs.	May 1—30	Pieces of sod and runners generally used.
(2) Ky. blue	40 lbs.	Jan. 1—Mar. 15, also Sept. 20—Oct. 15	
(3) Meadow fescue	50 lbs.	Sept. 1—15, also Mar. 1—15	
(4) Orchard grass	35 lbs. for hay 15 lbs. of seed	Mar. 1—15 or earlier	
(5) Red top	12—18 lbs.	Sept. 1—Oct. 10, also Mar. 1—15	Often sown at same time as wheat.
(6) Rye grasses	50 lbs.	Sept. 1—15	
(7) Sweet vernal	30 lbs.	Sept. 1—15	Use only in mixtures 2—3 lbs.
(8) Tall oat	33 lbs.	Sept. 1—Oct. 15, also Mar. 1—15 or earlier.	
(9) Timothy	12—18 lbs.	Sept. 15—Oct. 10, also Mar. 1—15	Often sown at same time as wheat.
Japan Clover	12—25 lbs.	Apr. 1—30	25 lbs. seed for full stand the first season.
Kaffir corn	5—6 lbs. for seed 10—12 lbs. for fodder	May 15—30	

Crop	Rate of seeding per acre	Favorable dates of Seeding.	REMARKS
Millet	2—3 pks. for hay 5—8 lbs. for seed	Apr. 15—July 15	For seed plant early in 3 ft. drills and cultivate.
Oats			
(1) Spring	2—2½ bu.	Feb. 20—Mar. 15	
(2) Winter	2—2½ bu.	Sept. 15—Oct. 1	
Peanuts	2 bu.	Apr. 20—May 20	Plant in 26—28 in. check rows two kernels to hill.
Rape	3—5 lbs. broadcast 1—2 lbs. in drills	Mar. 1—15, also Sept. 1—20	
Rye	1½—2 bu. for grain 2—3 bu. for pasture	Oct. 1—30	For orchard cover crop sow August 15—30, also may be sown any time in August for pasture.
Sorghum	10—12 lbs. in rows for forage 90—100 lbs. broadcast 3—4 lbs. for either syrup or seed	May 15—June 15	
Soy beans	½ bu. in rows 1½ bu. broadcast	May 1—June 30	May be planted from April 15 and early varieties as late as last week in July.
Tobacco	"Heaping table spoonful for 100 sq. yds." sufficient for 6—10 acres.	Feb. 1—28	Seed sown in specially prepared beds. Transplant to field May 15—June 10.
Velvet bean	½—¾ peck	May 1—30	Plant in 4 ft. check rows 2 seed in the hill. Does not mature in this state.
Vetches			
(1) Alone	20—40 lbs.	Aug. 15—Sept. 15	Will survive winter when sown any time in October.
(2) with oats, etc.	15—20 lbs.	Sept. 15—Oct. 1	
Wheat	1—1½ bu.	Oct. 10—20	

B—GARDEN CROPS.

Crop	Rate of seeding per acre	Favorable dates of Seeding.	REMARKS
Asparagus	4—5 lbs. or 1 oz to 50 ft of drill	Mar. 1—15 or earlier	Roots transplanted in November or any time in winter.
Beans			
(1) Bunch	1—2 bu.	Apr. 15—Aug. 10	Soil must be warm in particular for limas.
(2) Pole	10—12 qts.	April 24—July 4	
(3) Lima	½ bu.	May 1—30	May be planted as late as June 30.
Beets	5—6 lbs.	Mar. 1—30	Often planted earlier also any time up to August 1.
Cabbage	¼ lb.	Oct. 5—15	In cold beds for extra early. Transplanted to field Feb. 1—28.
		Jan. 1—31	In hot beds. Transplanted to field Mar. 1—15.
Cantaloupes	2—3 lbs.	May 1—July 1	For succession also as late as Aug. 1.
		Apr. 15—30	For extra early.
Carrots	3—4 lbs.	Mar. 1—20	
Cauliflower	1 oz. for 1,000 plants	Jan. 1—15	Start in hot bed. Transplant to field Apr. 1.

Crop	Rate of seeding per acre	Favorable dates of Seeding.	REMARKS
Celery	¼ lb.	Feb. 20—Mar. 20	Sow as early as possible in spring. Transplant to field in July or early August.
Cucumber	2 lbs.	May 1—July 1	For succession as late as August 1.
		Apr. 15—30	For extra early.
Egg plant	1 oz. for 1,000 plants	Feb. 1—15	Start in hot bed. Transplant to field May 1.
Horse radish		Mar. 15—Apr. 15 (roots)	
Kale	3—4 lbs. broadcast	Aug. 20—Sept. 20	On extra rich land may be sown October 1—30.
Kohlrabi	⅓ oz. for 100 ft. of drill	Feb. 10—20	Start in hot bed. Transplant to field April 1.
Lettuce	1 oz. for 1,000 plants	Mar. 1—15	Or earlier in open field. Any time throughout summer for succession also throughout winter in hot beds.
Mustard	1½—2 lbs.	Feb. 20—Sept. 15	
Okra	3—4 lbs.	Apr. 15—May 10	
Onions*			
(1) 5—6 lbs. seed in drills.		Feb. 20—Mar. 10	Or as early as possible. For spring use set large Danvers in field August 15—Oct. 15 and potato onions October 15—November 15.
(2) 30 lbs. seed broadcast for sets.			
(3) 6—12 bu. small sets.			
(4) 100-200 bu. large Danvers according to size.			
Parsnips	4—6 lbs.	Mar. 1—15	
Peas	1—2 bu.	Mar. 1—15 or earlier	
Pepper	¼ lb. or 1 oz. to 1,500 plants	Feb. 1—28	Start in hot bed. Transplant to field May 1—10 or even later.
Potatoes	10—14 bu		
(1) Irish		Mar. 1—30	
(a) Early			
(b) 2nd crop		July 15—Aug. 5	
(2) Sweet	5—8 bu.	Mar. 15—Apr. 1	Start in hot bed. Transplant to field April 20—May 15. Do well when transplanted up to June 15.
Parsley	1 oz. to 100 ft. of row	Mar. 1—15 or earlier	
Pumpkin	4—5 lbs.	May 1—15	Usually planted with the corn.
Radishes	8—10 lbs. in drills	Mar. 1—May 15	For winter radishes plant August 10—20.
Rhubarb		Mar. 1—15 or earlier	Roots may well be set any time in winter.
Rutabaga	3—4 lbs. broadcast 1—2 lbs. in drills	July 1—30	
Salsify	8—10 lbs.	Mar. 1—15	
Spinach	15—20 lbs.	Mar. 1 or as early as possible also Sept. 1—30	When weather in cool.
Squash			
(1) Bush	4—6 lbs.	Apr. 15—30	For extra early.
(2) Running	3—4 lbs.	May 1—15	Safe dates for all.
Strawberry plants		Mar. 1—30 or earlier.	
Tomatoes	¼ lb.	Feb. 15—28	One month earlier if to be shifted twice. Set in field April 15—30 for extra early. May 1—June 15 safe dates.
Turnips	1—1½ lbs. broadcast 1—1½ in drills	Aug. 1—10	
Watermelons	4—5 lbs.	May 1—June 10	

*Hardy vegetables such as onions, spinach, mustard, lettuce, peas and also Irish potatoes are frequently planted to advantage during any warm spell in January of February.

A NEW BULLETIN ON THE TICK PROBLEM.

Bulletin 94 of the Tennessee Agricultural Experiment Station entitled, "The Cattle Tick and its Relation to Climate," a joint work by E. C. Cotton and J. F. Voorhees, will be sent out in a few days. It consists of two parts, Part I. "Life History Investigations" and Part II. "Relation of Life History to Climate."

PART 1.

Part 1 begins with a general discussion of the sporadic occurrence of the Texas fever in several of the Northern states, previous to the establishment of the Federal Quarantine line. Calling attention to the fact that the infection did not survive the cold Northern winters the inference is drawn that cold is the limiting factor of the Northern distribution of the tick and therefore of the fever which it transmits. This conclusion is borne out by experiments at Knoxville, designed to determine the effect of low temperatures on the adult, egg and seed tick stages of the cattle tick, during the past five years. As a corolary of the above conclusions the author believes that although zero weather is of comparatively rare occurrence within the tick belt, when it does occur the tick area may be greatly reduced if the opportunity is grasped and a new quarantine line established, coinciding with the Southern limit of zero temperature, thus preventing re-infestation by the introduction of infested cattle from further South.

Special emphasis is placed on the absolute necessity for thoroughness in all phases of tick eradication and also on the value of a fixed rotation of crops as aid in this work.

Of the three stages of the tick studied the engorged adults were found to be the more easily affected by low temperatures, many being killed by a temperature of 23 degrees Fahrenheit while all not protected by a covering of some sort were destroyed when the mercury fell to 14 degrees. Those protected by litter or chaff were able to survive much colder weather, but if the covering happened to be wet they were killed at if unprotected.

A temperature of 4 degrees above zero is fatal to all seed ticks, while two degrees lower is required to destroy the unprotected eggs. Eggs protected by chaff or other litter, if dry, were able to survive these temperatures and hatch in the spring. Hence eggs deposited about straw stacks and in sheds or barns, where they would be kept dry, are considered as sources of reinfestation and special measures advised in dealing with them.

PART II.

When an attempt was made to apply, along the northern border of the tick area, the recommendations based upon life history studies of the tick in the extreme South, where most of the pioneer work was done, it was found that these recommendations would not fit the conditions incident to the shorter and cooler summers. Because of this lack of harmony in the results obtained at different places it was early deemed desirable to determine the fundamental principles involved.

Hunter and Hooker in Bulletin 72 of the United States Bureau of Entomology, tentatively suggested the law of accumulated effective temperature as a measure of the time necessary for the development of the various stages of the tick. It was soon found, however, that we were little better off than before for the reason that results derived from an application of this law to investigations carried on at any point were applicable only at that point or other places having a very similar climate and would not apply under other conditions.

After an exhaustive study, Mr. Voorhees has determined that the length of time necessary to hatch the eggs of the cattle tick is governed by two factors: the "initial temperature," the temperature when the eggs are laid, and the "daily increment" of temperature. Knowing the temperature at the time the eggs were laid and the daily rate of increase in temperature it is possible to predict, to within a very few days, the date of hatching of the eggs. This law also holds in the case of seed tick longevity and will be of untold benefit in the practical work of tick eradication, for by its use may be determined the time necessary to keep stock off of a pasture when following the starvation method. It is also valuable when the oiling or dipping method is followed for success here depends upon continuing the work until all of the seed ticks have attached to the stock and have been killed by the dip or wash, or have died from starvation while waiting for a host.

In this part of the bulletin are a large number of maps based upon the above law, which will be of great benefit to the practical farmer for they show at a glance the information it is desired to convey. In the first twelve maps are shown graphically the time necessary to starve all seed ticks on pastrues at any point in the tick area, the eradication work beginning on the first day of each of the twelve months. One map shows the beginning of the shortest period at a large number of points and another the length of the shortest period necessary to starve the seed ticks. Twelve maps are used to show the length of time necessary to hatch the eggs if laid on the first day of each of the twelve months.

From a knowledge of the temperature and moisture requirements of the tick as determined by experiments made at Knoxville and a study of the climatic conditions within the tick area and of that just outside, the author has arrived at the conclusion that the limiting factors in the distribution of the tick under natural conditions are low temperature and low humidity. That the tick is unable to premanently infest any region subject to regular recurrences of zero weather or where the mean yearly relative humidity falls below 60 per cent.

The authors believe that this law of "Initial temperature" and "Daily increment" will be of great value in the study of problems dealing with the development of plants as well as insects.

CHICKENS.

J. N. GILMORE, '15.

Ever since history began poultry has been mentioned by historians, and none of them mentioned it as being a newly acquired part of the established order of things. The Chinese and Japanese have been expert poultry breeders for many centuries. Eggs have long been used by Pagan and Christian in the observance of religious rites. Even at the present day, eggs are used by children in the joyful hours of Easter-day.

Poultry includes ducks, geese, turkeys and chickens. Chickens are what I will try to tell about. They are divided into several classes. Each class has several breeds, while a breed may have as many as six or eight varieties. The classes are, viz: Asiatic, Mediterranean, Spanish, French, and English, last but not least, is the American class. We will take one class, the American, and note the different breeds in it. They include the Orpington, Plymouth Rock, Wyandotte, and Rhode Island Red. A good example of the varieties which a breed may have, is the following: Orpingtons, have six varieties, viz: Buff, White, Diamond Jubilee, Rose Comb Black, Single Comb Black and Spangled.

It is not necessary to give all the breeds and varieties, and it is of little value to know them all any way. We will now speak of the types and the most importnat breeds of each.

1. Egg Type—Includes Leghorns, Minorcas, Spanish, Andalusian, and Hamburgs. Characteristics are small size, active disposition, sensitiveness to cold, good foragers and poor setters.

2. Meat Type—Brahmas, Cochins and Langshans. These are large, slow fowls, poor foragers, good setters and poor layers.

3. Dual purpose Tpye—Plymouth Rocks, Wyandottes, Rhode Island Reds, and Orpingtons. These are medium size, fair layers, good mothers and more active than the meat breeds.

4. Fancy Type—Bantams, Polish, Anconas and Cornish. None of these are good for egg or market purposes, but are bred for show purposes entirely.

So many ask the question, which is the best breed of fowls? The fact is that one breed will do as well as another if given the right care. If you start on a very small scale, choose only one of the egg breeds, preferably the Leghorns and one of the meat breeds, say Brahmas. Perhaps better results can be made by using a general purpose breed. The Barred Rocks are found to be superior for this purpose. In purchasing stock, unless you are experienced and can tell a good chicken, buy from some one whom you can absolutely rely upon. You should know the fowls' pedigree. They may look perfectly all right, but sickness and bodily weakness run in some families of chickens, while others that have been carefully bred are noted for their strength and vigor.

Chickens are subject to several diseases. The principal ones are roup, diarrhea, limberneck and gape;

and lice, while not a disease, is the greatest enemy of the chicken. Impure water, filthy quarters, and the eating of decaying animals cause the most of these diseases. Bacteria in the ovaries and eggs of hens cause white diarrhea in the young chick.

The way to overcome the diseases of poultry is to use clean houses, pure water and grains or mashes fed in clean troughs. Don't crowd too many hens in one house. Make the roost more than three feet high or the hen will not fly up to it. Don't make it too high as a heavy fowl hurts its feet when it hits the ground. Keep the houses warm, line with tarred paper. Supply light and ventilation, and remember that fine quarters do not make fine birds. Comfort is the one thing which a chicken needs. Too many farmers and poultry raisers are prone to feed whatever they raise most. That is a mistake; the hen needs a balanced ration just as the cow does. A number of rations might be recommended, but we have found the best one to be one made by myself, with equal parts wheat, oats and barley or corn for morning feed; at noon a light feed of wheat, oats, sorghum and corn, all cracked; and at night corn and oats. Oats have a great egg-producing value. Bran, grit and oyster shell, and charcoal are kept before the birds. Every day or so a mash is fed; it can be made of bran middlings and corn meal, a little cut clover, a pinch of salt and a bit of red pepper for seasoning. Blood or bone meal should be fed to take place of the bugs which the chickens eat in the summer. Give the hen good feed, clean water, a dust bath and clean, airy, warm quarters, and the egg-supply is certain.

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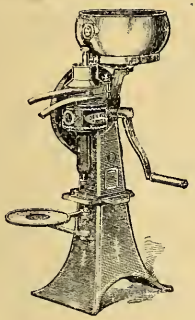

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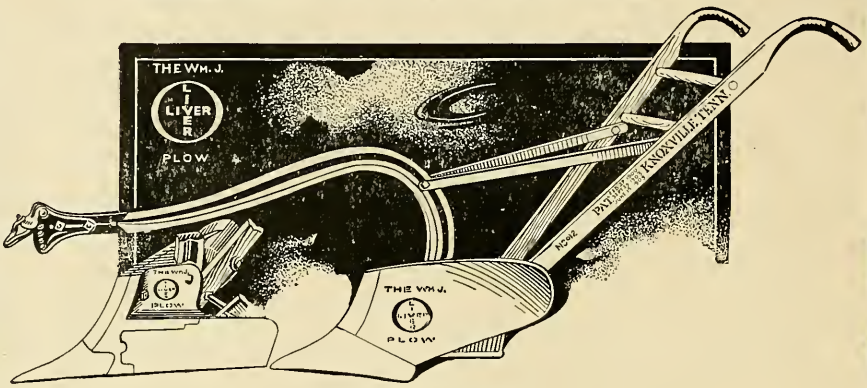

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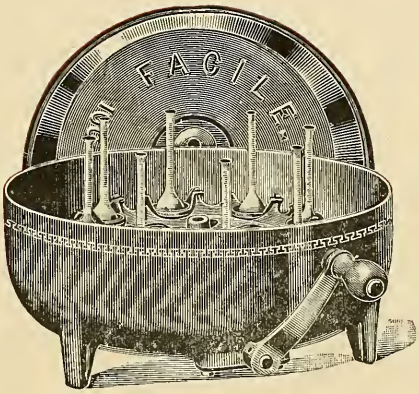

BABCOCK TESTER
See Page 64

Vol. VI. DECEMBER, 1911 No. 3
Published Monthly by
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KNOXVILLE

University of Tennessee

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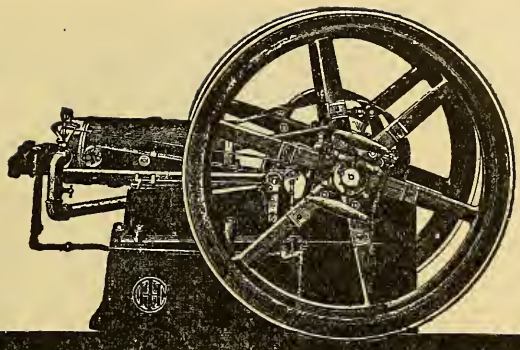

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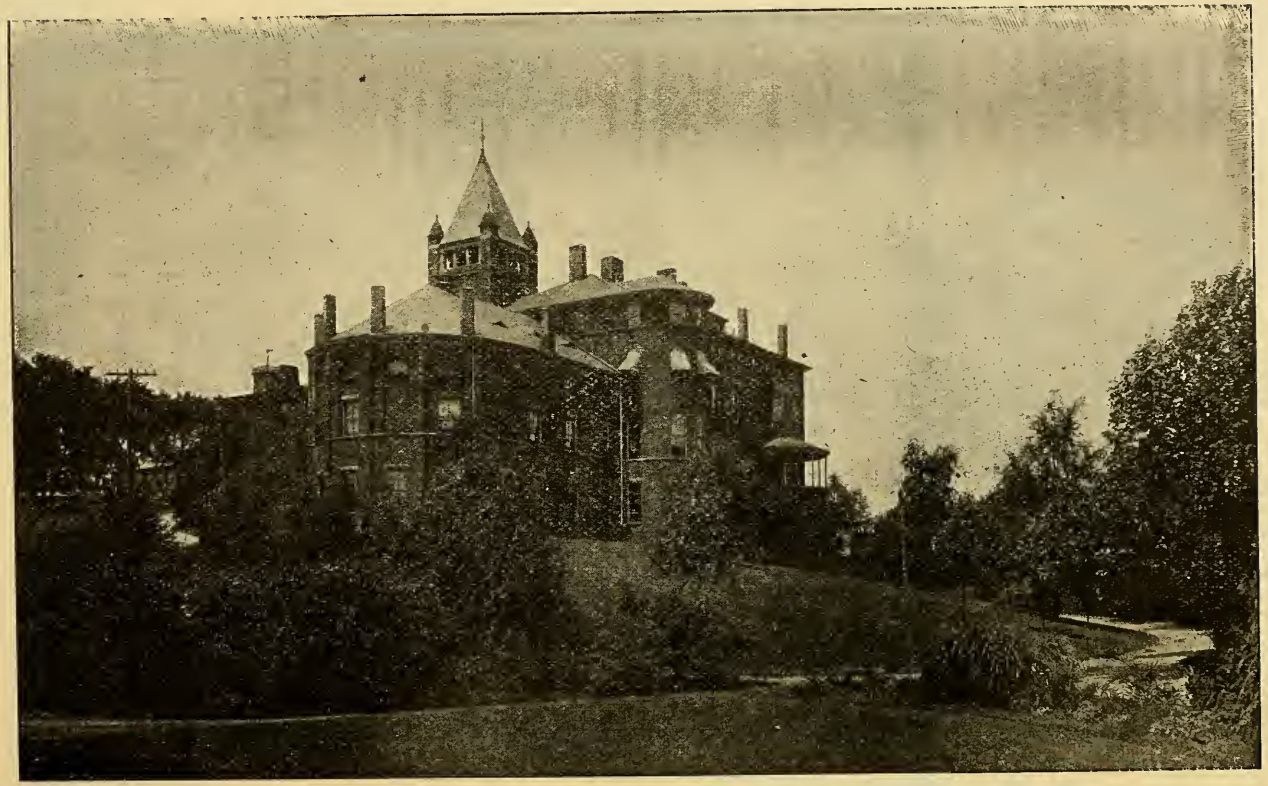
The bureau is a center where the best ways of doing things on the farm, and data relating to its development are collected and distributed free to everyone interested in agriculture. Every available source of information will be used in answering questions on all farm subjects. Questions sent to the I H C Service Bureau will receive prompt attention.



SCIENCE HALL, UNIVERSITY OF TENNESSEE.

THE U. T. FARMER

Vol. 6. DECEMBER, 1911. No. 3

"HUMAN AND BOVINE TUBERCULOSIS."

By A. L. RUBIN, '14.

In some of our dairy states, tuberculosis is very prevalent among milch cows. Apart from the enormous losses sustained by the dairy interest in the gradual wasting away and final death of these cattle, the question as to the relation of bovine and human tuberculosis is becoming more and more insistent. How many of the thousands of adults and children carried off every year by this awful disease have contracted it from infected milk? Unfortunately, the facts regarding this subject are not well established. However, we do know that market milk very often contains living tubercle bacilli which is some way find lodgment in the human system and produce this disease.

The milk secreted by tuberculous cows does not necessarily contain tubercle bacilli. They may be detected with certainty only when the animal is suffering from a generalized tuberculosis, or has tuberlous lesions in the udder. Nevertheless, even though the milk as it is secreted may be free from these germs, they may find their way into it during the process of milking.

The feces of tuberculous cattle even when the disease is not far advanced may contain millions of living tubercle bacilli. The animals do not expectorate and tubercular matter thrown off from their lungs passes through the alimentary canal and is excreted without destroying the organisms. It has been estimated that the thirty pounds of moist feces produced daily by the average cow would contain in the case of a diseased animal about 37,000,000 microscopically tubercle bacilli.

Taking in consideration the facility with which particles of such feces get into the milk from the body of the cow, from the air and from the bedding, walls, and floor of the stable, it is not at all surprising that the germs of bovine tuberculosis are so frequently found in marketed milk and in marketed butter. Further proof as to the degree of infection of the feces from the tubercular herds may be found in the alarming increase of tuberculosis among hogs that are allowed access to such feces, or are fed on skimmed milk. The disease may be transmitted to hogs by adding quantities of feces from tubercular cows to the milk or other food given to them.

The theory has been advanced that bovine tubercle bacilli can not produce tuberculosis in human beings. It is also said that if they

could, the pulmonary tuberculosis, or tuberculosis of the lungs, would show an increase instead of a decrease and that if infection was due to milk, intestinal tuberculosis would be quite common instead of being comparatively rare, according to the decrease of pulmonary tuberculosis among men which is shown by recent statistics, this cannot be accepted as a proof against the infection of milk containing germs of bovine tuberculosis. Better Hygienic conditions and perhaps a greater degree of acquired immunity may go far toward accounting for this disease. The statistics available at present do not indicate that intestinal tuberculosis among children has decreased within the last generation.

There are numerous facts on record that show that tuberculosis among human beings has been brought about by drinking milk from tuberculous cows. It has been demonstrated that these germs when swallowed with the food may pass readily through the intestinal walls and finally lodge in the lungs and produce pulmonary tuberculosis. Hence (whatever difference of opinions, there may prevail as to the extent of human tuberculosis brought about by consumption of milk and milk products,) it is said by sanitarians that presitent efforts should be made toward the eradicating of bovine tuberculosis.

Municipal and state regulations reinforced both by an intelligent use of the tuberculine test and by methods of immunization will make the more or less complete extinction of this disease. These regulations which are now being carried on throughout the state will not only increase the value of milk for the human family, but, also, will add to the profits of the dairyman and will relieve him from the constant anxiety as to the health of his herd. In the meanwhile, the consumer of milk must seek safety in the pasteurization or boiling of the milk, or at any rate should patronize the dairyman who honestly endeavors to keep tuberculosis out of this herd.

LIMESTONE.

By JOHN R. TITSWORTH, '13.

Calcium carbonate in the form of chalk or marl has been used as a fertilizer from the earliest times of which we have any record. As early as 1795 the farmers around Rothamsted, England dug huge pits from which they removed the easily pulverized chalk and spread it over their land. It is said that such heavy applications were made at that time that they do not need lime to the present day.

Calcium carbonate is obtained from chalk, marl, ground limestone, ground seashells and burnt limestone. Wood ashes have also been used as a source of lime. The fertilizer value of lime lies in the calcium carbonate and all other forms must be changed to calcium carbonate before they can be utilized by the plant.

Burnt limestone is called caustic lime on account of its caustic action.

Ground limestone is perfectly harmless when it is brought into contact with the skin but if burnt lime is brought in contact with the skin it immediately sets up an irritation. This same action is noticed in the soil. The organic matter is simply burned out of the soil. This might be an advantage in peaty soils for a time but for ordinary farm land it would be disastrous.

Burnt lime has some chemical effect on the phosphorus and potassium which renders them more available. This causes a greater loss by leaching. Burnt lime stimulates the soil to excess. The first two or three crops after burnt lime has been applied may exceed the corresponding crops after an application of ground limestone. The Pennsylvania Experiment Station ran a series of experiments for sixteen years, demonstrating burnt lime and ground limestone. At the end of sixteen years it was found that the average yield for the ground limestone was the higher, also that the soil was in a better condition where the ground limestone was used.

The reason for applying lime is to correct the soil acidity. Ground limestone will do this without stimulating the soil to excess. No investigator advocates the use of burnt lime over ground limestone.

If lime must be shipped for a long distance, burnt lime may be cheaper than ground limestone, for it only requires one-half of the bulk. But if it is used, liberal applications of phosphorus and organic matter must be made to keep up the fertility.

There are four ways by which lime is lost from the soil. When organic matter decomposes, corbon dioxide is thrown off. This converts the carbonate of lime into the bicarbonate. The bicarbonate is very soluble and readily leaches from the soil. The next important method by which lime is lost from the soil is what is used by the plants. During the process of nitrification nitrate of lime is formed. This form is also very soluble and readily leaches from the soil. Muriate of potash also causes considerable loss. It converts the carbonate into calcium chloride which is exceedingly soluble.

Lime is one of the most important fertilizers with which we have to deal. If the soil becomes "sour" or acid the bacteria are unable to do their work properly. Upon the bacteria depends the proper decay of organic matter and proper nitrification. Lime acts as a base which "sweetens" the soil or neutralizes the acidity.

There is no large area in the State of Tennessee which will not respond to liming. The Central Basin and the Cumberland Plateau are especially low in lime. Even the "limestone" soils of Middle Tennessee are low when compared with generally accepted standards. Even when the chemical analysis shows a fair percentage of lime the carbonate form, which corrects acidity, may form only a small part of it.

One ton of ground limestone will correct the acidity, but it is much cheaper to make heavier applications. Two to four tons every four years is a very good amount to apply. One ton of burnt lime every four years is a good application. The heavier the application the more

profit per ton. The lighter the application the more profit per acre. This rule holds true not only for lime, but for any fertilizer.

Lime is generally applied late in the summer or early in the fall. Lime and phosphorus should not be applied together as the lime seems to retard the availability of the phosphorus. If they should both need to be applied at the same season it could be done in this manner. The phosphorus could be put on with the manure, disced and plowed under. Then the lime could be mixed in while preparing the seed bed. This would leave the lime in the first few inches of soil and the phosphorus just below it but not in contact with it. In any case, it is better to apply lime as a top dressing.

THE BABCOCK TEST.

FRANK S. CHANCE, '14.

Many dairy men have in their herds some cows that give a good flow of milk, but it is not rich in butter fat. It is necessary to know not only the amount of milk a cow gives, but the amount of butter she produces as well, in order to know her real value. Several methods have been devised for ascertaining the amount of butter produced by each cow in a herd, but the one now universally used is what is known as the Babcock Test. Its operation is based upon the fact that the fat, (or cream) found in milk is lighter than the other milk solids, and hence it can be separated from the solids not fat by means of centrifugal force.

The Babcock Test is thought of by some as being complicated and difficult to understand but in reality its operation is very simple. The apparatus needed are a centrifugal machine, a small glass tube called a pipette, holding 17.6 cubic centimeters, a test bottle having a graduated neck, a glass cylinder for an acid measure, and a pair of ordinary dividers.

To make the test, the sample of milk should be thoroughly mixed by pouring from one vessel to another three or four times. Then take 17.6 c c (cubic centimeters) of the milk with the pipette and place it in the test bottle shown in Fig. 1. When samples of each cow's milk has been taken in this way, add

(Fig. 1.)

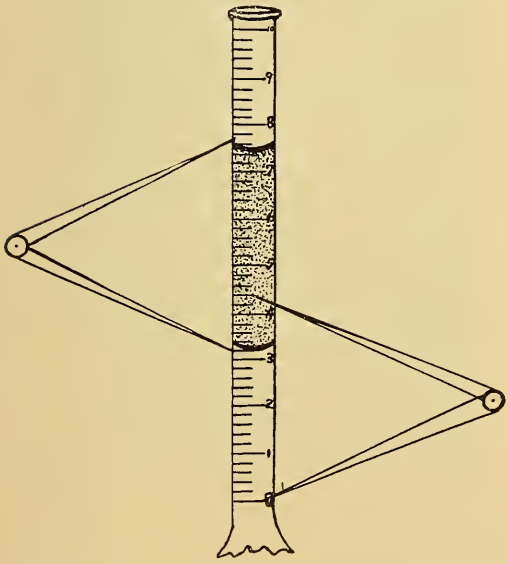
(Fig. 2.)

17.5 c c sulphuric acid to each sample, using the acid measure shown in Fig. 2. Care should be taken that none of the acid gets on the fingers or clothing. Now hold the bottle

*Cuts loaned by Missouri Agricultural College.

by the neck and give it a gentle rotary motion until the acid and milk are well mixed, as indicated by the dark chocolate color.

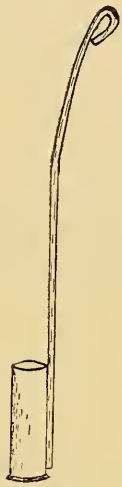
When all the samples have been heated in this way they are placed in the centrifugal machine shown on front cover and whirled for four minutes. The machine is then stopped and the bottles filled up to the neck with hot water. After again whirling for one minute, sufficient water is added to bring the fat well up in the neck of the bottles, when they are given an additional whirling of one minute. They are then set in hot water for a few minutes to bring the temperature up to about 140° F., when the per cent of fat is read off as shown in Fig. 3.



(Fig. 3.)

First, place the dividers as shown on the left hand side of the figure, measuring the length of the fat column. Now place one point of the dividers at 0 and the other point will indicate the percentage of butter fat present.

To determine the amount of butter produced by each cow it is only necessary to know the number of pounds of milk given and the per cent of fat. It is a good plan to weigh the milk from each cow in the herd for say, two days out of every month and the total yield for the month can be calculated from these figures. Each time the milk is weighed, take a small sample with a dipper as shown in Fig 4, and



(Fig. 4.)

place same in a half-pint milk bottle, or a small glass fruit jar. If the sample is kept in a cool place it will keep sufficiently sweet for two days. These samples can then be tested as described and the amount of butter determined. For example, suppose a cow has given 600 pounds milk during the month and the test was 4 per cent. This means that in every 100 pounds milk there are 4 pounds butter fat. Then in 600 pounds, there are $6 \times 4 = 24$ pounds butter fat. But it has found that a given amount of butter fat will make about one-sixth more butter than there was butter fat, owing to the water, salt, etc., found in butter.

This one-sixth is called the overrun. Adding the overrun, found by dividing 24 by 6, we have 28 pounds as the amount of butter produced.

A complete testing outfit can be purchased for $5, and it takes up a few hours each month to make the test. The time and money expended in this direction will yield the dairyman a high rate of interest, and no farmer keeping a half-dozen cows can afford to be without a Babcock tester.

LATE IRISH POTATOES.

By G. B. THACKSTON, '14.

When conditions are such as they were in Middle Tennessee this year when the early potato crop was almost a complete failure, there is hardly anything that will make more profit for the farmer as a side crop than late Irish potatoes. They can always be made profitable provided they be planted and cultivated intelligently.

The ground for the potatoes should be a moist loam. Potatoes cannot stand much dry weather. The ground should be prepared in the finest possible condition before planting. It should be plowed at least twice and harrowed in every direction until there is not a clod to be seen. Work in preparation will save much in cultivation.

After the land has been thoroughly prepared it should be laid off in rows about 3 feet apart. The furrows should be very deep and muriate of potash should be placed in the rows, about 50 to 100 pounds per acre. The potatoes may be planted in July or August. They should be cut with two eyes to the piece and one piece dropped every 12 to 15 inches. Cover deep.

When the potatoes have gotten a few inches above the ground scatter nitrate of soda between the rows, 50 to 100 pounds per acre. Some prefer to make this in two applications, about ten days apart.

In cultivating, a small cultivating harrow may be used when the potatoes have just peeped through the ground; after this, cultivate regularly every 7 to 10 days. Keep the rows free from weeds with the hoe. If there is little rainfall, the small harrow should be used altogether in order to conserve the moisture in the ground.

If these methods are carried out, there is no reason why the result should not be a fine crop of potatoes and when prices are such as they were this year a handsome profit will be realized.

LET US SMILE.

From "Brush and Pail"

The thing that goes the farthest
towards making life worth while,
That costs the least and does the most
is just a pleasant smile—
The smile that bubbles from a heart
that loves its fellowmen,
Will drive away the cloud of gloom
and coax the sun again.
It's full of worth and goodness, too,
with manly kindness blent—
It's worth a million dollars, and
doesn't cost a cent.

THE U. T. FARMER

Scientific; therefore practical

Published Monthly by the Agricultural Club of the University of Tennessee.

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Advertising rates will be sent on application.

EDITORIAL.

T. B. THACKSTON

While the Agricultural Special train just operated in East Tennessee was the result of a co-operative movement by the Southern Railway, the State Department of Agriculture, and the College of Agriculture of the University of Tennessee, still, back of, and underlying the movement, there was an indomitable spirit on the part of one man that lent greatly to its success.

This man, Mr. T. B. Thackston, representing the Land and Industrial Department of the Southern Railway was once a farmer himself, and is familiar with the needs and the conditions of the farmers, and knows where and how he can help them.

Through his efforts, together with the progressiveness and far sight of Mr. M. V. Richards, of Washington, D. C., Land and Industrial agent of the Southern Railway, and the Co-operation of the State Department of Agriculture, and the College of Agriculture of the University of Tennessee, the farmers of this section of the state received the benefit, free of cost, of the lectures, exhibits, demonstrations and the practical lessons from the "Agricultural Special." In fact, Mr. Thackston was in charge of the train. He planned for the greatest possible good at each stop made by the train, and to this end, he was successful.

Such a far sighted policy, indicating its progressiveness, on the part of the Southern Railway, is highly commendable. This movement has helped wonderfully to stimulate the agricultural interests in this part of the state. And we hope that in the end, the Railroad will get more farm freight and express business, which will, in a way, reimburse the company for the thousands of dollars that such a movement must have cost.

The good equipment and the care that was taken in conducting the train and its corps of speakers, the courtesies extended these by the Railroad officials and crew, are likewise commendable.

We feel safe in saying that the farmers of East Tennessee are deeply grateful to the Southern Railway which made possible this movement, and to the Railway officials who so enthusiastically gave their services.

At the present, farming with explosives is being advocated to a great extent. A demonstration in soil dynamiting was recently given at Powell's Station, eight miles from the University. This demonstation consisted of three uses of dynamite; namely: subsoiling, uprooting stumps and making excavations for setting fruit trees.

A small area, about one-tenth of an acre, of a wheat field was used as a place for subsoiling. Holes 15 feet apart each way, about four feet deep and three inches in diameter were made, half a stick of dynamite was placed, and tamped with a fuse extending to the surface of the soil, in each. When the load is fired, the subsoil is broken, forming little cracks in all directions, from the discharge, for about seven feet. This increases the water holding capacity of the soil. Roots have their feeding zones increased many times. Records are being kept of this test in order to see if this method of subsoiling is profitable or not. It takes about ten dollars worth of dynamite to subsoil an acre effectively.

Next, three large oak stumps were blown out. The dynamite was placed in holes and tamped under the stumps from all sides. A battery was used here in order to fire off the charges to make sure that all loads be effective. It costs from one to three dollars to up-root a large stump. This method of stump pulling seems to be very practical.

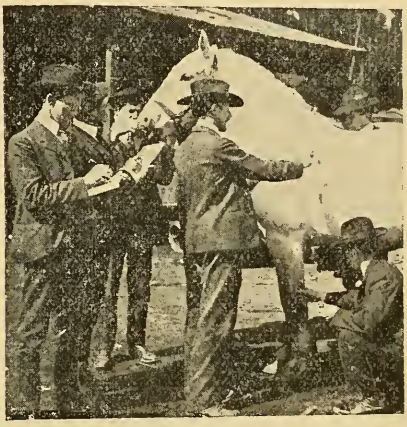
Two excavations were made for tree planting. In one hole a stick of the explosive was used, while half of a stick is enough for the second type of hole. Each method causes a large hole. Some soil has to be refilled in before planting the tree. This explosive caused the soil to fracture in all directions and the roots can penetrate the hard soils. It costs from eight to ten cents to fire one charge. This is a profitable method and can be used by anyone.

The Short Course in Agriculture at the University of Tennessee will be held from January 1, until February 24, 1912. It is hoped that the former agricultural students as well as the short course students will send the word to other young men and encourage them to come and help in this grand cause. By doing this, they will open their eyes to the importance of scientific agriculture in the development and con-

servation of the country's natural resources, and to the necessity of introducing more intelligent methods of production and distribution.

Furthermore, the wealth of the world and the sustenance of its inhabitants rests upon the foundation of farm labor—and that labor must be carried on with intelligence, skill and efficiency to avoid great natural loss. The most progressive among the agricultural classes, who have broken away from the prejudices and ignorance of the past, are those who have gone out in search of knoweldge, which assists them in improving their farms and rural conditions. Many have obtained this helpful knowledge from the short courses. Perhaps, they did not receive the wished for amount of information in the short course, but it started them to thinking along the most successful lines and from that they have gained untold benefit.

The short course consists of lectures and practical demonstrations along all lines of farm work, given by men who have very extensive knowledge along all phases of farming. Their lectures offer a splendid opportunity to any person to gain a varied knowledge of farming—courses are offered in agronomy, live stock, dairying and horticulture. Much time is spent in each course doing the actual or practical work under the supervision of experts.



Now since such excellent opportunities are offered to all young men as well as old, to obtain a knowledge of farming under the method of the 20th century, can the farmer boy miss this? Come young men! It means much to you individually, and to your community.

At the 38th annual meeting of the East Tennessee Farmers Convention, last May, plans were discussed and funds provided to build a hall upon the Experiment Farm to be used as a stock judging pavilion and also as a lecture hall where the Conventions will be held. It is to be known as Temple Hall and is now being built.

Excavation work is completed and the foundations were started on the 18th of November. It will be ready for use at the next meeting in May.

The Tennessee Experiment Station has recently published some new bulletins, which every progressive farmer of Tennessee should have. The following bulletin will be sent to any farmer of this state, free of charge, upon application to the Station: Experiments with Fertilizers and Field Crops and Important Soil Types of Middle Tennessee; Tobacco Insects of Tennessee; Tobacco Culture in Montgomery County; Relation of Temperature and Rainfall to Crop System and Production; and Fertility Experiments in a Rotation of Cowpeas and Wheat.

ALFALFA ON WILDWOOD FARM.

By H. D. FOLMER of Ohio.

This book was written by a farmer of fifteen years' experience with alfalfa, the author also being familiar with all the literature on the subject. There are eight full page illustrations in the book and twelve chapters dealing with the following subjects:

Introduction, Our First Experience, Other Experience, The Best Way of Raising it, How to Make the Hay, How to Feed it, Alfalfa for Pasture, Plowing the Sod, Alfalfa Sod for Corn, Why Some Do Not Succeed With Alfalfa, Possibilities of Alfalfa, Conclusion.

The writer has had both failures and successes—they are given in the book with the reason for both; and the author is confident that Alfalfa can be raised on practically every farm if the farmer informs himself sufficiently and stays with it.

Published by the Author, West Jefferson, Ohio at $1.00. postpaid.

THE OLD BARN.

Low, swallow-swept and gray,
Between the orchard and the spring,
All its wide windows overflowing hay,
And crannied doors a-swing,
The old barn stands today.

Deep in its hay the Leghorn hides
A round white nest; and, humming soft—
On roof and rafter, or its log-rude sides,
Black in the sun-shot loft,
The building hornet glides.

Along its corn-crib, cautiously
As thieving fingers, skulks the rat;
Or in warped stalls of fragrant timothy,
Gnaws at some loosened slat,
Or passes shadowy.

A dream of drouth made audible
Before its door, hot, smooth, and shrill
All day the locust sings.....what other spell
Shall hold it, lazier still
Than the long day is, now tell:—

Dusk and the crickett and the strain
Of tree-toad and of frog; and stars
That burn above the rich west's ribbed stain;
And dropping pasture bars,
And cow-bells up the lane.

Night and the moon and katy-did,
And leaf-lisp of the wind-touched boughs;
And mazy shadows that the fireflies thrid;
And sweet breath of the cows,
And the lone owl here hid.

—Ex.

AGRICULTURE EXHIBITS AT THE STATE FAIR.

A. S. ADSMOND, '12.

The County Exhibits at the State Fair this year were well represented, and showed considerable interest and efforts toward getting good exhibits. They were much better than last year both in variety and quality, in spite of the fact that the season has been very unfavorable for most all crops.

The corn exhibits from single counties had five entries. This is quite a small representation for 96 counties. Nevertheless those entered were good. H. K. Morgan, Shelbyville was awarded first prize. This entry included fifty varieties of 10-ears each. It was a well selected corn with reference to uniform length, size and good ends of each variety. C. S. Looney, Winchester, took second prize. This exhibit contained 75 varieties but were not of as good a quality as the former, especially in the filling out of the ends. The third prize was awarded to Gresham Bros., Smyrna. This exhibit lacked in number of varieties and a few general points.

The county grain exhibits included wheat, barley, oats, rye, and other small grains. Each variety was shown in the exhibit by one-half bushel of grain and a three inch grip of the plant as it grew. There were four entries in this lot. Parks W. Walker, Buntyn, took first prize. This was an excellent exhibit of grain including fifty varieties of wheat, twelve of barley, twenty of oats, a few of rye and some millet, flax and rice. C. S. Looney of Winchester, was given second. This was also a good exhibit but lacked in number of varieties. Geo. Eleazer, Burns, took third prize with a fairly good exhibit.

The exhibits of legumes included all the clovers, vetches, field peas, soy beans, etc., from a single county. There were only three entries in this lot. P. W. Walker, Buntyn, received first money. This was a fine exhibit of legumes and showed that they can be raised with good results in the western part of the state. The other entries were also good both being from Middle Tennessee. Second prize awarded C. S. Looney, Winchester, and third went to W. I. Gresham, Murfreesboro.

The general displays of agriculture and horticulture products from a single county were represented by three counties and were quite elaborate displays. The first money was won by Parks W. Walker, Buntyn, who had a very large display, and showed considerable skill in the selection of the various products. Geo. Eleazer, Burns, took second prize and also had a fine display, but was considerably smaller than the former. T. F. Perkins, Heartsville, took third money. This was a small display, but very neat and a fine quality of products.

The county exhibits of corn by a Boy's Corn Club, had only two entries. This was due to a misunderstanding as to whether the county exhibit should be shown at the county fairs or at the state fair. The two counties entered were Trousdale and Dickson. The former having fifteen ten-ear lots and the latter ten lots. Owing to the quality

of corn shown by these clubs the judges awarded no first premium. Trousdale County took second money and the other received third prize.

The tobacco exhibits from single counties were three in number, and showed a great improvement over last year, in decoration, quality and varieties of tobacco. The first premium was given C. E. Frey, Clarksville, Montgomery County, this was a very elaborately decorated exhibit of about thirty types, including the Austrian, Italian, German, French, different types Brimen tobacco, English strips, different grades of snuff leaf and luggs, African balers and Spanish grades. Each variety was true to type and well selected. The second prize was awarded to S. R. Glover, Springfield. This exhibit was almost equally as well decorated as the former, but lacked a little in quality and number of varieties. The third prize exhibit owned by H. L. Wells, Springfield, was poorly decorated, but was almost equal to the second in quality and number of varieties. So the judge had some considerable work in placing the two.

The named varieties of corn shown in ten-ear lots were considerably poorer this year than last. This was corroborated also by about one-third of the entries made previous to the fair failing to exhibit. The principal cause seemed to be due to poor filling out of the tips. This was explained as probably being due to imperfect conditions for pollination, caused by excessive rain and dampness during that period. It was also largely laid to the corn worms (Heliothis Armigera) which seemed to be more abundant this year than heretofore.

The Hoffman type was represented by 21 entries and was above the other varieties in a few points. Tom Morton, Haley, Tenn., received first prize, Miss E. L. Reeves, McLean Station, Nashville, took second money and Wesley Reeves of same place took third prize.

The Boon or Johnson County corn was represented in fifteen entries, much of which was fairly good. The first and second prizes were awarded Gil T. Buford, Pulaski, who also carried away the same honors at the 1910 fair, but the previous prize winning ears were considerably better than this year's. The third prize was given Vance Davidson, Wortrace.

The Tennessee Red Cob type also included fifteen entries, but of an inferior quality, being large and uneven selections, the first premium was given A. M. Dement, Cortner, second money went to H. N. Lazener, Franklin, and third prize was given J. J. Reasor, Gallatin.

The Tennessee White had thirteen entries of a fair collection. The first and second prize entries were far superior to the others and were awarded to J. W. Scott and daughter Nancy Lee, of Gallatin, R. No. 3, the winners of the same honors in 1910, except that the daughter took first. The third prize was given A. M. Dement, Cortner.

The ten-ears Reid or Leaming type, yellow had twelve entries. This seemed to be a fair selection considering everything. The first prize was given C. S. Walker, Buntyn. J. M. Gresham, took second

money, and Geo. Eleazer received third prize.

The Improved Watson type had only eleven entries but was considered the best lot of the named varieties at the fair. The Champion entry of ten-ears was also awarded in this variety. Guy Chunn, Shelbyville, R. 3, received first premium on this variety and also champion over all other entries. Second was given H. K. Morgan, Shelbyville, R. 5, Mr. Morgan was also a winner in this variety last year. Roy Holeman, took third money.

The Hickory King variety was represented by fourteen entries, most of which was rather poor in many respects. J. H. C. Leigh, Franklin, took first prize. He was also a winner in this lot last year. The second prize was awarded S. B. Beame, Clarksville, and third went to Geo. Eleazer.

The nine entries of Iowa Silver Mine, was fairly good, and first prize was won by J. W. Scott, Gallatin, R. 3, also a winner in 1910 in this lot. The second and third prizes were awarded to Gresham Bros.

In the ten-ears Yellow Dent, other than leaming type there were eleven entries, but were not a good lot. The first prize was awarded J. W. Tyson, Paris. Second went J. M. Gresham, and third to Roy Holeman.

The Red or Strawberry type was represented by nine entries which were also considerably below the previous year's corn. J. H. Keene, Heartsville, took first prize and Robt. Hopkins carried away second and third honors.

Lot No. 17, varieties not listed above had twenty-six entries, but they were of an exceptionally poor selection, so much so that nothing above third prize was awarded, and was received by H. K. Morgan, Shelbyville. In this lot there was a mixture of all the colors in which corn is found, with irregular lengths and sizes.

The entries of white corn by individual members of the Boy's Corn Club over the state were seventeen in number. This lot was somewhat better than last year, considering the season. It also shows that the boys are becomming interested in some localities. The first premium was won by Guy Chunns, Shelbyville, R. 3, who was also first winner in the Watson type of corn. The second money was taken by Reamond L. Hoffman, Normandy. And third went to Miller Deament, Cortner.

Other varieties than the white corn shown by Boy's Corn Club members had only four entries and was of a very poor quality. The judges did not award any first and second prizes. Third prize was given Guy Bishop, Burns.

The Cereal exhibits were quite well represented and of a fair quality, since the season could not effect the showing qualities of grains as it had corn. The Cereals were shown in bags of one-half bushel each. The smooth headed wheat lot consisted of ten entries. Many of which were good. The first money was won by S. W. Warfield, Columbia, Miss E. C. Reeves, McLean Station, Nashville, received second premium, and Botey Gresham, Murfreesboro, third.

The bearded wheat lot was represented in eleven entries and was also of a fine quality, first prize was awarded to H. J. Wells, Shelbyville,

R. 5. This entry also took champion prize of all the wheat exhibited, second money was awarded Parks W. Walker, and third to Copper S. Walker, both of Buntyn.

The oat exhibits were also fairly well represented, the winter oats consisting of nine entries was good and heavy in weight. The first prize was won by R. B. Williams, Winchester, second by G. K. Walker, and third by J. M. Gresham.

The rust proof oats only had four entries, but were good oats. All three prizes were won by the Walker Bros., Buntyn.

The burt oat was well represented, having fifteen entries. Some of the entries were good oats while others were quite poor in this variety. All three prizes were won by Gresham Bros., Smyrna, R. 2.

The White Spring oats had seven entries, most of which were fairly good. The Gresham Bros., took first and third, and second was awarded R. G. Buchanan, Murfreesboro.

The Black Spring oats, were only represented in two entries. This being a new variety it was not shown as extensively. First was won by J. M. Gresham, and second by Geo. Eleazer.

The winter barley lot only had four entries, but were of an excellent quality. First was won by C. S. Looney, Winchester, while the second and third went to Gresham Bros.

The winter rye lot consisted of six entries, most of which were good. The first premium was won by W. O. Gresham, second by Walter Buchanan, Murfreesboro, and third by Geo. Eleazer.

The Horticulture exhibit was for superior to that of last year in spite of the late frost in the spring, which did so much damage for the orchardists. The principal thing noticed was the lack of care, in spraying the fruit against fungus diseases, which cause Blothches on the apples principally.

The vegetable entries were also much larger than last year, but were mostly by market gardeners near the fair grounds.

The Agriculture exhibits were of a better quality than the preceeding year. One great advantage was the increased room over last year. One interesting feature of the fair in the agriculture exhibits was that almost without exception, the premiums were won by a few exhibitors, who exhibited in a great number of lots. These people are men who have been visiting the fair for years studying the points in each variety that will make perfect exhibiting products. Why not more of the farmers get busy and learn more about what constitutes a good type of the various products, and divide this prize money more widely over the state.

JUDGING CORN.

CHEMICAL SOIL ANALYSIS.

C. A. HUTTON, '13.

A chemical analysis of the soil is the determination of the amounts of plant food elements it contains. The chief of which are nitrogen, phosphorus, potash and lime.

There is an idea prevalent among farmers that a chemical analysis of their soils will show just the right kind and amount fertilizer to apply to each crop in order to get the best results. While such an analysis is of great value, yet its interpretation in terms of the needs of the plant depends upon so many conditions that the results are often such as to render the analysis of little value.

The analysis as frequently made make no distinction between the total plant food and the available plant food. To be available for use by the plant, the food material must first be in solution. In the soil, the solution is accomplished chiefly by water and a small amount of acids. In the laboratory, various acids are used for dissolving the soil sample. When strong acids are used, it is evident that large amounts of the elements of plant food will be dissolved than is the case in the soil. For example, an analysis may show that even the poorest soils contain sufficient plant food for one hundred average crops, yet these soils produce not. This is true largely because much of the plant food is insoluble in the soil water. To obviate this difficulty, different methods have been employed in the laboratory, as the using of weak acids, and even water, as solvents. But even then the conditions in the soil cannot be fully imitated.

Again, there are many circumstances which may influence the results when put into practice in the field, such as the physical condition of the soil, climatic and other changes. Soils may be unproductive from physical as well as chemical reasons, so that a chemical analysis to be of value should be accompanied by a physical examination of the soil.

The real value of chemical analysis of the soil is in showing the possibilities of production, that is, in revealing the presence of very small or very large amounts of plant food. This fact is well illustrated by the work of the Tennessee Station. The soils of the state are divided into several groups, or classes, such as limestones, dolomite, shales, sandstones, alluvial soil, and so on, according to their formation. Each of these important types of soil have been analyzed and studied, and fertilizer experiments have been carried out to determine their needs. The results have been published in bulletin number 78. Every farmer in the state should have a copy of this bulletin, as it gives a brief description of the different types of soils and their chemical analysis. The interpretation of these analyses is sustained to a marked degree by the field experiments and furnish a guide for further investigations.

After carefully reading this bulletin, if the farmer does not find exactly the information he wants, it would be a comparatively simple matter for him to carry out some fertilizer experiments on his own

farm. A piece of well drained soil representative of the farm should be selected. This area should be divided into nine plots. To one plot, apply a fertilizer containing only nitrogen; to another apply phosphorus; to the third, potash; to the fourth, nitrogen and phosphorus; to the fifth, nitrogen and potash; to the sixth, potash and phosphorus; on the seventh, put a complete fertilizer containing nitrogen, phosphorus and potash, and leave two plots unfertilized as a check. By noting the yield from the different plots and comparing with the results of the Station, much valuable information can be secured. The solution of the problem of the present manural needs of soil probably lies in a combination of soil analysis and field experiments. Such a combination should show the needs of the soil better than can be done by either method alone. A soil analysis is of value as indicated, but should be sustained by actual field tests.

BACTERIA IN THE SOIL.

By H. P. OGDEN, '13.

Soil bacteria are both beneficial and harmful. The useful bacteria are those that cause decay, nitrification and nitrogen fixation.

Should dead plant and animal refuse cease to decay, the surface of the earth would soon be cluttered up with their remains; and furthermore, the soil would soon be robbed of its available phosphorus, potassium and especially nitrogen. Hence there are two good purposes served by decay. To these may be added the good resulting from the improved physical and chemical conditions produced by decay. Decay produces humus and humus is unequalled in improving the water holding capacity and tilth. No soil can long remain fertile without humus. Almost all the plant food salts are locked up in the soil in unavailable forms and no matter how finely ground will never be of value to plants until dissolved. The substances resulting from decay are the chief agencies which bring the miner foods into solution, thus making at least four ways in which decay promotes fertility.

One phase of decay which is of supreme importance is that which deals with the conversion of nitrogen compounds into nitrates. This process is of such special importance; first, because plants rely upon nitrates to furnish them nitrogen; secondly, soils contain less of them than any of the other salts plants take from the soil and rocks and the deeper subsoil contain none at all; thirdly, nitrates are the most soluable and most readily lost; hence the importance of constantly replacing that loss.

We must rely upon bacteria to maintain our nitrate supply—they are cheaper than buying nitrate of soda and generally more satisfactory. To carry on this process certain kinds of bacteria must be present. They are usually present and often amount to many million per cubic inch. If they are not present

a thin coat of manure will inoculate the soil with all kinds needed. These bacteria must have oxygen for exactly the same reasons as plants and animals, viz.: to oxidize foods to produce energy. In all cases, these—nitrifying—bacteria give off simpler waste products than they consume and products higher in oxygen. In short, nitrates are the final waste products of nitrifying bacter. These bacteria will not grow nor produce nitrates in wet, poorly drained soil where they can get no air nor in any soil where air is excluded from any cause. For this reason we drain land and plow to admit air.

In the second place bacteria die in great numbers if soil is dried out. Nothing will decay if kept perfectly dry. Thirdly, nitrifying bacteria will not flourish in acid soil hence we lime such soils. Bacteria will not produce nitrates when the temperature is below 40° F., consequently we do not plant crops needing much nitrate during the winter or early in the spring without applying nitrate of soda to them.

Lastly, bacteria will not work without food. we must suply them with decomposable organic matter containing nitrogen if we expect them to form any nitrates. This we can do by plowing under green crops and manure, and we must do it. This question is more important to us Southern farmers than to our Northern brothers because our climate favors a more rapid decay and loss of humus than theirs and our cropping systems requiring so much cultivation and stirring of the soil admits oxygen again very greatly promoting rapid burning and loss of humus. Our farming systems will never be satisfactory until we provide for better maintenance of humus.

The third important function of bacteria as mentioned in the first paragraph is that of nitrogen fixation—assimilation of the uncombined gaseous nitrogen of the air. There is no more impo.tant function of bacteria. Had it not been for this process the plants and animals if any would have been very different from those peopling the earth today. With the exception of a few pounds connected into ammonia by lightening, all the combined nitrogen of the world has been caught from the air by microscopic bacteria. This amounts to millions of tons including all that in the soil plants, animals, the sea and the vast deposits as sodium nitrate in different regions, to say nothing of the tons that have found their way back to the atmosphere through burning and certain kinds of decay.

There are three classes of bacteria that have done and are still doing this great work, consisting of (1) those living upon the organic matter in the soil, (2) those living in the cells of various algae, and (3) those living in the little tubercles on the roots of legumes. All possess one characteristic of animals,—they must have carbonaceous food. The first one gets it from humus, the last two from the living sap of the host. All three possess the distinction of being the only organism known to exist which have the ability to assimilate uncombined nitrogen.

They do not do this because they like to nor for the good it does all other forms of life but simply to get nitrogen needed in their bodies

just as we eat meat or beans. They combine it with carbon, hydrogen, etc., to from proteins similar to those found in plants or animals. Their benefit does not come from nitrogenous waste products as in the case of nitrifying bacter but rather in a storage of body protein which will become available when they die and decompose.

The chief way to favor their work is to grow legumes on soil well supplied with all the mineral elements needed by them and showing a neutral or alkaline reaction. Experiments are being carried on with a view of increasing our knowledge regarding conditions affecting activity of the azotobacters (those living on humus.)

Space for bids a discussion of the harmful bacteria in the soil. Suffice it to say, however, that if proper methods are adopted which favor development and activity of the beneficial forms, little harm will be experienced from the others.

The main points we should bear in mind are that bacteria are necessary for getting rid of wastes and making foods available, especially nitrogen, and also that the activity of the beneficial species are influenced by air, water, temperature, and food supply. Manure contains the most important species and hence is valuable for inoculating land possessing few of the right kind. Humus increases activity of all kinds. Lastly, the growing of legumes furnishes food for the most useful species for assimilating free nitrogen and also furnishes the very best material for nitrifying bacteria, especially is this true if the legume crop is fertilized with the needed mineral salts and turned under.

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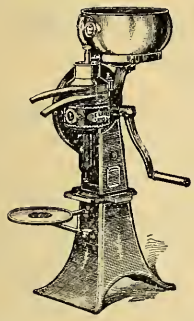

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Michael K. Boyer, Hammonton, New Jersey.

Associate Editor "The American Poultry Advocate" Syracuse, N. Y., Says on

Dipping Eggs in Zenoleum

The writer was told that the Pittsfield Poultry Farm Company, Pittsfield, Maine, used the preparation Zenoleum for dipping hatching eggs, and not understanding what success could be secured by so doing, wrote F. W. Briggs, the manager, for particulars. His reply is as follows: "We dip all of our eggs in Zenoleum and believe that it helps to make the chickens healthier, that is more free from white diarrhoea, etc., later. We do not believe that it will help the chicks to hatch any.

"We used to dip each egg separately in a pail containing 8 quarts of water and one gill of Zenoleum, but found this to be a very slow process and so we have a tank made in which we dip the whole tray of eggs. This gives the same results and less labor."

This is certainly a new wrinkle and would be discredited did it not come from such a reliable source as the Pittsfield Poultry Farm Company. While visiting The Niagara Farm of W. R. Curtiss & Company at Ransomville, N. Y., the writer learned that Zenoleum was used after each hatch for disinfecting the incubators, and that as a disinfectant it had no superior, but dipping eggs in it to prevent disease we must confess is a new idea.

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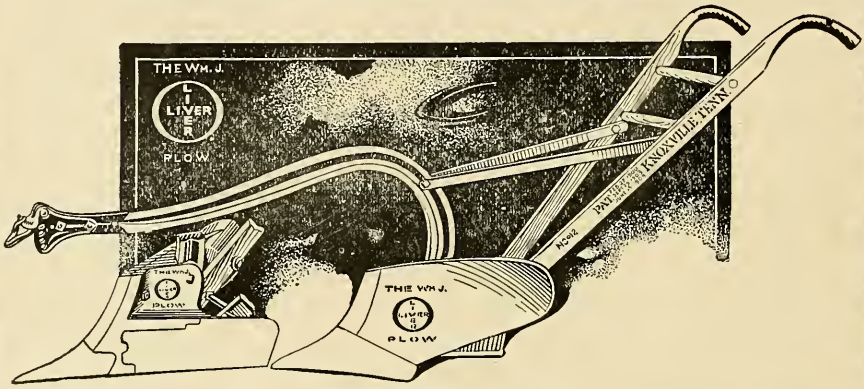

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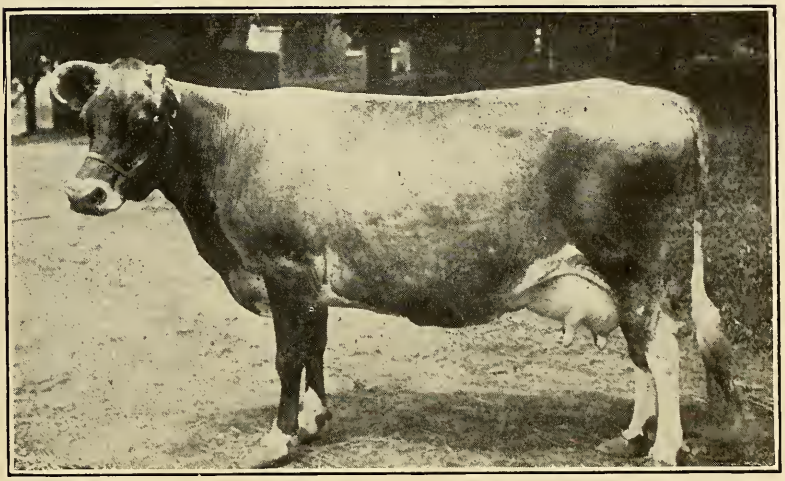
DAIRY NUMBER



BELLE BARONETTI (163613)
Yearly Record 11,113 pounds Milk, 796 pounds Butter.

Vol. VI. JANUARY, 1912 No. 4
Published Monthly by
THE AGRICULTURAL CLUB
of the
UNIVERSITY OF TENNESSEE
KNOXVILLE

University of Tennessee

College of Agriculture

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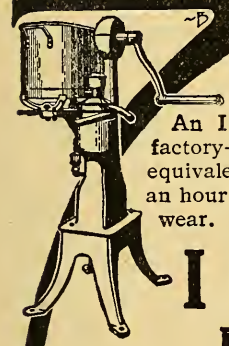
Bigger Cream Checks Sure For Years To Come



Just because a separator skims close is not sufficient reason for buying it. Equally important is the question of durability.

An I H C Cream Harvester was put to a year's test at the factory—running steadily for 10 hours every working day. This is equivalent to 20 years of ordinary use, figuring on a basis of half an hour's daily service. Yet in all this time there was no perceptible wear. What better proof of I H C durability can you ask?

I H C Cream Harvesters

Dairymaid and Bluebell

have been paying cow owners big dividends for years. Their skimming qualities are unequalled—their ease of turning—ease of cleaning—and durability are easily proved by the testimony of owners. Why not investigate?

You will find that I H C Cream Harvesters are the only separators with dust-proof gears, which are easily accessible. The frame is entirely protected from wear by phosphor bronze bushings. The I H C has large shafts, bushings, and bearings. The patented dirt-arrester removes the finest particles of dirt from the milk before the milk is separated.

I H C Cream Harvesters are made in two styles—Dairymaid, chain drive, and Bluebell, gear drive—each in four sizes. The I H C local agent will be glad to point out the above features and many others, or, write direct for catalogues.

International Harvester Company of America
(Incorporated)
Chicago USA

I H C Service Bureau

The Bureau is a clearing house of agricultural data. It aims to learn the best ways of doing things on the farm, and then distribute the information. Your individual experience may help others. Send your problem to the I H C Service Bureau.

A TRIBUTE TO THE COW.

In the "Jersey Bulletin."

I am impressed that some of the characteristics of the dairy cow are modesty, fidelity, patience, constancy and industry, and for these qualities she commands our admiration and is entitled to our most generous consideration. I commend this wonderful animal to you for her intrinsic worth. For thousands of years she has furnished a table delicacy that is not only desirable but a necessity. This animal that by the Hindoos is worshipped, that is regarded by them as having no superior, that is represented as stairs that lead to heaven and that are adored in heaven, this noble, silent partner of ours is man's best friend and to whom we owe the most of the source from which we get a large portion of every meal.

When we awake, we behold the walls on which the plaster has been held by her hair, we fasten our clothes with buttons and we comb our hair with a comb that is made from her horns. We put on our feet a pair of shoes made from her skin, and as we enter the dining room and sit down to a tempting breakfast, we find she has provided us with a piece of cheese, a cup of milk, a pitcher of cream for our coffee, a plate of hot cream biscuits, a dish of butter, a smoking beefsteak, and above everything else, are the bright, interesting, idolized children, whose foster mother she is. We go to our office and fasten together important documents with glue made from her hoofs, and when we go to dinner we enjoy from her bountiful provision, soup made from her tail, elegant roast beef, pumpkin pie made with her milk out of pumpkins grown on land fertilized with her bones, and we eat it with teeth that through a chemical process has been made from her paunch.

She is the only animal that works day and night. By day she gathers food and by night she converts it into these articles of diet and usefulness. In this country she commenced her mission at Plymouth Rock, and, tied behind the dust-covered emigrant wagon, she has gone with man to the setting sun.

As westward the star of empire took its course, she went in advance of civilization and not only prepared the way but made it possible for the early settler to stay. It was her sons that hauled the emigrant wagon and broke the sod in the early settlement of this country. She endured all the hardships of the pioneer, and during her march as well as when settled, she picked up the straws that blew her way and furnished the milk to fill the breast of her who rocked the cradle and fed the babe that became a ruler.

THE U. T. FARMER

Vol. 6. JANUARY, 1912. No. 4

RELATION OF SOME FEEDS TO THE MILCH COW AND DAIRY PRODUCTS.

By R. R. BLAKE, '12.

In the primitive state of our dairy animals, milk was produced primarily for the growing calf and while it may be no less so now-days than formerly, man has so intensified the milking capacity of our present day dairy breeds as to get a margin over and above the needs of the baby animal. This intensification has resulted from selection and change of environmental factors until today our milch cows are truly abnormally developed.

Since it is true that all young animals use a relatively greater amount of phosphoric acid and lime during the nursing stage than any subsequent period, the source of this ash supply is worthy of consideration. Calves store up approximately 14 pounds of phosphoric acid and 16 pounds of lime during their first year of existence and if we should inquire where this amount of mineral matter comes from, we would find the source is the cow. This indulgent nurse will deny her very bones and body to supply the needs of her young. The ash for the developing framework as is also the muscle building material or protein, is provided in the milk, very slightly affected by the ration used. That the feed has little influence upon the quality of the product produced is apparent from the fact that Jersey milk is Jersey milk, and the milk of any other breed no less constant, under normal conditions, practically independent of the source or nature of the mixtures in the ration.

We see that generally speaking the various milk constituents cannot be fed into the milk but can only indirectly influence it through the medium of the cow. Some of the feeds which contribute to the dairy cow's supply and in turn to the growing young may justly claim our attention here.

Of the feeds rich in phosphoric acid may be mentioned, cereal grains, bran, oil cake, brewer's grains, malt cooms and tankage while some of those notably deficient are, straw and chaffy cereals, mangels, potatoes, distillery refuse and molasses. Without a sufficiency of this element, normal development is impossible as well in the cells of the body growth as in the bone production.

Feeding stuffs which may be named as rich in lime are the following: Clover and meadow hay, alfalfa and other leguminous hays together with cotton seed meal and tankage. Deficient amounts are

found in the various cereal straws, chaffy cereals, cereals and their by-products, roots and molasses. Recent investigators in this field of work, have shown that those feeds which show a marked deficiency in the mineral elements can be largely remedied by the introduction into the ration of either mineral or organic compounds, not popularly classed as food, which supply the missing elements. Ground raw-rock phosphate, bone meal and tankage are widely advocated in this connection.

The protein building is sustained by the use of clover, alfalfa, cowpeas and soy beans—the roughage portion as well as the seeds—together with cotton seed meal and linseed meal. All the leguminous crops, properly, are valuable as a source of portein and mineral material while the grains collectively are superior to the fodders.

Phosphoric acid, lime and protein are no less essential to the growing boys and girls of our country than to the young animal and unconsciously this fact is recognized by our dairy herds. The food given our milch cows should be of such a composition that she may continue to perform her beneficent function, supplying this rich article to its various uses, without drawing upon her individual vitality.

While it is true that the ration plays no part in directly influencing the several milk components for any period, it may be said that some feeds have the properties as to temporarily modify the composition of the milk. Soy bean oil has been found to act as a direct supplement to milk fat and palm-nut cake and cocoanut cake have given an increase of one-half per cent in fat composition.

Mention has not been made as to the source of various other body compounds since they are, generally, quite abundantly supplied in our common feeding stuffs.

Although the dairyman can little manipulate the composition of his herd's milk, yet he can materially increase the flow by selection of a proper ration. Good pasture grass has been found to give best results as a milk producer while soilage and silage hold high rank. Succulent forages of whatever sort are superior to the same in the dried condition. Roots are good is promoting a strong flow and grains should never be denied the dairy cow. Straws and other ligneous feeds are not classed as milk producers although, by the addition of water, thus rendering them more palatable, many such feeds are made materially more efficient than the untreated. Well cured hays are not often benefited by this additional treatment. Peanut meal, castor oil bean meal, and poppy-seed cake have been found to decrease the milk flow one per cent.

Much discussion and numerous conflicting opinions have been expressed relative to the influence of several feeding stuffs upon the quality of milk and butter fat after their use in the ration. In connection with this point it has been shown by a number of scientific investigators that the "off-condition" of butter is directly and proportionally modified by the feeding.

Late-cut meadow hay and in general all over-ripe roughages have a tendency to produce an article of a

tallowy consistence with a high melting point. Green fodders which have been allowed to unduly mature have a similar action. Autumn grass may act unfavorably while grass from a sour soil whether used in the green state or fed as hay tends to produce a hard butter. Straws of various kinds, sugar-beet leaves, mangels, potatoes, ground peas, vetches, palm-nut and cocoanut meal, linseed cake and cotton-seed meal, all incline to produce a butter of a rather hard texture.

Contrary-wise, crushed oats, corn and wheat bran may give the butter a more soft and oily consistency. Gluten-meal, oil-meal, rice-meal and rape, sesame, sunflower-seed cake and soy beans are also classed here.

Quite a thorough investigation of the influence of soy bean meal and soy bean oil has been carried on by the Massachusetts Agricultural Experiment Station to ascertain the effect of soy bean meal and soy bean oil upon the composition of milk and butter fat and upon the consistency or body of butter.

Soy bean meal partially extracted and fed at the rate of 2.3 pounds per head daily, seemed to be without any influence in changing the different milk constituents, relatively, or in importing any flavor to the milk. The chemical character of the butter fat was not modified, neither was the separation of the fat from the serum affected, time of ripening, nor thoroughness of churning. No flavors were detected by experts but the butter was somewhat softer though not to the extent of impairing its commercial value except during warm months. The softness was charged to the oil and not to the protein.

Soy bean oil at the rate of 16 pounds per head daily, left no influence upon the composition and flavor of milk but caused a marked softness in the butter which also contained 2 per cent more moisture than did normally produced butter and collapsed at 80° F.

From what has been said it is seen that soy beans tend to produce a butter of less firmness than is desirable, while on the other hand by numerous tests, they have proved superior to cotton-seed meal as a milk producer both in quantity and quality. Theoretically, a high class article would follow the judicious mixing of the nitrogenous concentrates, soy beans, cotton-seed meal and linseed meal—with the carbohydrate corn. A hard-working dairy cow should never be allowed to perform her work on a ration devoid of concentrates of this nature. These concentrates together with leguminous hay and carbohydrate succulent hay would make a very palatable and nutritious feed for our milch cows.

The color of butter adds much to the market value of this product and is sought in a variety of ways, as from the use of certain feeds as well as by the addition of some coloring material. Corn and pasture grass are very efficient in producing this result. Carrots, pumpkins, and some other feeding stuffs also import a yellowish tinge to milk fat. Breed characteristics and even individual characteristics play a greater part, however, than do any feeds that can be fed. The Jersey and Guernsey breeds surpass all others in import-

ing this coloring to the butter fat.

Flavors of milk and butter have varied sources. Musty and moldy feeds, spoiled silage and decomposed grains give bad flavors to dairy products. Large amounts of roots of all kinds, potatoes, distillery waste, bran that contains corn-cockle, rape cake in quantities greater than 2 pounds daily, impart undesirable flavors to the milk. Heavily fed residues from the manufacture of linseed oil together with onions, leeks, turnips and rape, due to the volatile oils of the latter, give an objectionable flavor to milk while green rye and silage impart flavors detected by some but pass unnoticed by others. A grass flavor is sometimes occasioned on starting the cow on early spring pasture. Some of these feeds lose their bad effect when fed immediately after milking.

Ragweeds may produce a bitter milk. Advanced lactation is, occasionally, the cause of this condition, wholly independent of the material eaten. Flavors and aroma of butter are mostly due to fermentation of milk sugar but many odors and flavors which are charged to the feed or to the cow are due to stable contamination.

COMMUNITY BREEDING FOR TENNESSEE.

By J. CARL McAMIS, '12.

Progress and co-operation have gone hand in hand in all lines of business. Agriculture is not an exception to the familiar axiom which says that there is strength in union. In this day of rapid improvement in American agriculture, organization of the farmers in all lines of endeavor has proven itself one of the most efficient remedies for existing conditions.

One of the phases of work which best lends itself as a basis for organization of farmers is community breeding. The term community breeding has been applied to a variety of associated activities of live stock farmers, but in general it refers to the combined effort to produce a single breed of one or more kinds of live stock, adhering to a more or less uniform type.

In the past it has been the tendency of the American farmer to select that breed of farm animals which was least represented in his community, doubtless thinking that he would profit by the very scarcity of his animals according to the law of supply and demand. But in his case the law of supply and demand was overruled by other factors in the economy of production, and the farmers of many sections have found that instead of selecting a breed because it is not well represented in their locality, it is better to select a particular breed because it is best fitted to the natural and artificial conditions in their locality. They are associating themselves into permanent organizations which have for their direct purpose the production and improvement of a particular breed of live stock. Their work also includes the marketing of their produce and in case of dairy farmers a co-operative creamery or factory is operated by the association.

The general plan for organizing

such associations is to call together all the farmers of a given community who are engaged in any form of live stock production. Some speaker should be present who can explain the plan of the organization and the benefits to be derived from it. The first thing to be done is to determine whether or not there is a sufficient number of interested farmers to establish an organization. A dozen live interested farmers are enough to start the movement. A list should then be made of all the prospective farmers of the community whether they have agreed to join the association or not. In this connection it is beneficial to determine also the value of the output of the finished product from the community. These facts will show the possibilities of the organization. Each of the prospective members should be visited and have explained to him the purpose of the organization.

At the first meeting a temporary president should be elected who should call a second meeting at an early date. At this meeting a permanent president, secretary, and treasurer should be elected. Also a committee should be elected whose duty should be to procure a business manager who is to keep in touch with the market and attend to the marketing of produce, the buying of breeding animals and the advertising of the stock of the community.

There are a few general rules which the members of the organization must adhere to rigidly. The first and most important is that they agree to market all their produce from the live stock through the organization. Second that they breed to nothing but pure bred sires of the chosen breed which should be purchased and kept by the association. The third rule is that the members attend the regular meetings. For this reason, the territory over which the organization operates should not be too large. It is plain that the success of the organization is dependent upon the adherence to these general rules.

The details of the plan, however, must be for each community itself, but there is no good reason why some such plan should not be put into operation in every live stock producing section in Tennessee, whether it be beef or dairy production.

The many advantages gained by the so-called community breeding are both financial and educational. Considering the benefits from a purely economical standpoint there are several distinct reasons why co-operative breeding of a single type should be recommended.

As a general rule it may be said that there is one certain breed which is better fitted for service in a given community than any other. Each of our many breeds of live stock have been grown for generations under almost constant conditions and for a specific purpose. Different breeds have been reared under different conditions and for different purposes. It follows then that when they are removed from these conditions and expected to perform an entirely different work, the owner must be disappointed. Therefore the very first problem which the new association must face is the selection of a breed which is most suited to its conditions and needs. The safest policy is to study the history of breeds and choose that breed which

originated in countries having conditions similar to its own and stick to that breed. The State Experiment Station might render valuable advice in the matter.

What is meant by the choice of a breed is really the choice of sires to be used in the community, because it is not hoped nor advised that all the members buy entirely pure bred females for their herd but instead, they must use this native stock and look for improvement through the exclusive use of high class males. The small breeder is not able to own the very best sires but if he and his neighbors combine their capital they may all have access to the very best of the breed.

A worthy sire may be used by a portion of the members until inbreeding prohibits his further use, then he may be exchanged with other members for another sire. In this way no male need be discarded because of the dangers of inbreeding, before his qualities as a producer have been recognized.

The adoption of a uniform breed in a community will do away with the injurious practice of cross breeding. Cross breeding should never be practiced because it defeats the very purpose for which breeds have been produced. The breed has been selected and kept pure for certain characters so that the animal will transmit those characters. In crossing breeds the chain is broken and the offspring looses its power to transmit its character. He who cross breeds forgets that the hybrid off-spring is just as likely to possess undesirable characters of the parents as the desirable ones, which so frequently happens. It is far better that the farmer seek to improve his stock by the use of good pure breed sires of a particular type and breed.

What is needed is the systematic organization of farmers for the purpose of developing special types of animals for a special purpose. If this is done in any locality, it will become known over the county and even the state as a place where high class animals of the breed may be had. Buyers will thereby be attracted because they will be able to find a uniform product large enough to deal with on the market and therefore the farmer will be able to demand a high price for his produce.

The organization may be beneficial in the constant fight against disease in the section. It may hire an expert to test the herds for tuberculosis for instance and wherever found may be destroyed. In many places this is impossible without the combined influence of the breeders.

In dairy associations, the cost of testing cows both for advanced registry and for selection may be lowered by employing an expert to do all such work in the community at a single visit, thus reducing travelling expenses.

But besides the purely economical benefits of community breeding there are equally as great social and educational advantages. In the first place it has a strong tendency to create men's interest in the science of breeding, feeding and improvement of their herds. It creates a friendly rivalry in production of similar animals instead of rivalry between breeds.

One of the chief causes of a lack

of progress in agricultural education is the isolation of the farmer from his fellow man. The farmer must organize and associate himself with his fellow farmer to save himself from ignorance and wrong ideas. He must organize to protect himself from the organized business mind of the town. He must remember that the world's goods are continually moving from the hands of the unorganized to the hands of the organized. Along with a high type of civilization must be some measure of luxury and comfort, for which the farmer must depend largely upon his own efforts in association with his neighbors.

Community breeding tends to harmonize men's minds on one project in which they have a common interest.

WINTER DAIRYING.

By JUDD BROOKS, '12.

Many dairy farmers do not receive as great returns from their herds during the winter months as they should. They breed their cows so that they will freshen in the spring when the pastures are good, and by winter the milk flow is very low. Perhaps this decrease in milk production is due to the lack of good late pastures and that the lactation period is nearing its end. A constant milk production should be maintained at least eleven months out of each year in order to receive the greatest returns from the herd.

To make winter dairying profitable many factors must be taken into consideration. In the first place, the winter feeding operations must be made as much like those of summer as possible. This can be done by growing such ensilage crops as corn, soy beans, peas, sorghum, etc. These feeds should be as palatable and succulent as practicable when put into the silo. And again, a balanced ration should be computed, because if the cows are not given a ration sufficient to meet the maintenance requirements and those for milk production, satisfactory results can not be expected. With a high milk producing cow, it requires about fifty per cent of a liberal ration for maintenance and the remaining fifty per cent is transformed into milk. Thus it may be seen what the consequences will be if the cow does not have sufficient food. The food will be used for body maintenance at the expense of the milk flow.

To have the cows freshen in the fall means a greater flow of milk and a higher production of butter throughout the year. Advanced prices, even ten and twenty-five per cent, may be had for the winter product over that of the summer. Then, too, the expense for ice to be used in the coolers is less or negligible. Fermentation processes are eliminated to a greater extent and the milk can be held over a day or more if necessary.

Furthermore, if the cows freshen in the fall the calves can consume the skim milk then as well as they can in the spring, when the cows are on pasture. In the spring the calves are old and strong enough to utilize the fresh pasture grasses to a greater advantage. Not only

that, but they are larger and can consume greater quantities of skim milk. Perhaps the young succulent grass plant is of more benefit to the growing calf now than at any other time. It has been shown by many investigators that young tender grasses are much richer in phosphorus and lime than older grasses. This being the case, the calf will develop faster than it would if born at a time when it could not utilize the pasture. The elements, phosphorus and calcium (lime) are very essential for young growing animals, as a matter of fact, eighty per cent of their bones are made up of these elements. Then, too, the calf will be strong and can fight flies and stand the hot weather better than a spring calf that is dependent largely upon its mother for nourishment. Often the best dairy cows come from heifers raised under these conditions.

During the winter more care can be given the cows than in summer. The farm work is up and the farmer has more spare time then than he has in the spring or summer. Also by having his cows freshen in the fall they can be more properly fed, and as they lapse into the lactation period, which is in the spring, the fresh pastures come on and this means much toward stimulating the decreasing flow of milk. It also revives the cows to such an extent that actual records of herds kept when they freshen in the fall as compared to herds that freshen in the spring show an increase in milk production from 1,500 to 2,000 pounds per annum. And again, it is always a great advantage to have the cows dry during the hot days of the late summer because the flies are worse then than at any other time. Flies always cause the cows to worry and a decrease in milk production is the consequence.

The manure problem should be an item for consideration. More manure is saved during the winter than the summer, and investigators have shown that the value of stable manures depends largely upon the nature of the food consumed. When the cow is in full milk, feeds are given her in abundance. In turn, the manure is valuable and is saved while during the summer it goes to waste wherever dropped. Also fermentation processes are not as great in cold weather as in hot and for that reason more of the nitrogenous content is conserved.

Butter making can be carried on more profitably in winter than at any other time. It brings a price even twenty-five per cent better than it does in spring and summer. The farm hands can find employment in the dairy during winter and this enables the farmer to keep good help the entire year.

Since the Tennessee farmer can produce large supplies of ensilage, summer feeding conditions, where concentrates are used, can be kept up to a certain extent throughout the winter. The farm hands have constant employment, the calves are stronger and more able to utilize the spring pastures and large amounts of skim milk, and the profits for the dairy products are higher in winter than at other seasons. Therefore the dairy farmers, in order to obtain the greatest returns from their herds, should practice winter dairying more extensively.

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Scientific; therefore practical

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EDITORIAL.

Perhaps many farmers will be interested in knowing how much corn has been produced on an acre in Tennessee.

Last winter and early spring boy's Corn Clubs were organized in the various counties of the state. Each county offered prizes for the first, second and third highest yields on an acre. Maury County offered $175.00 to be given as follows: First prize $100.00, second $50.00, and third $50.00. The United States Department of Agriculture offered the boy who produced the highest yield on an acre a trip to Washington at the Government's expense. At Washington, Secretary Wilson, would present the winner a certificate pronouncing him a competent corn grower.

John Van McKibbins, of Maury County, won the first prize of his county and the trip to Washington by having the highest yield on an acre, which was 167.07 bushels. This is the highest yield ever produced on an acre of Tennessee soil. It exceeds the highest recorded by seventeen bushels.

The corn club furnishes a splendid opportunity for every farmer boy to test his ability to do something for himself. It results in his becoming more interested in farming operations. He will remain on the farm and strive to learn how to conserve his soil fertility and at the same time produce profitable yields. John McKibbins' yield was profit-

able because after all expenses were deducted he had left a profit of $50.00.

Four Systems Of Dairy Farming And The Profit On Each.—This is the title of circular No. 151 of the Illinois Experiment Station in which it is shown that the final test of profit in dairying depends not only on the efficiency of the cows but also on raising crops that yield maximum amounts of digestible nutrients per acre.

The rotations used in the different systems are as follows:

"System No. 1.—Corn, oats, corn, oats, timothy pasture, pasture, pasture.

"System No. 2.—Corn, corn, corn, oats, clover, clover, clover and timothy, pasture, pasture.

"System No. 3.—Corn, corn, corn, oats, clover, alfalfa, pasture, pasture.

"System No. 4.—Corn, corn, corn, corn, corn, alfalfa, alfalfa, alfalfa."

The comparisons are fully explained in this circular and a detailed account given for each system; a partial summary of results being given in the above table.

	System No. 1.	System No. 2.	System No. 3.	System No. 4.
Total digestible nutrients	245,182	322,359	379,126	617,730
Pounds milk per acre	991	1475	2025	3150
Value of milk per acre	$15.20	$22.62	$31.05	$48.30
Total value of milk produced	$2430.00	$3618.00	$4968.00	$7728.00
Total value of products sold	$2632.00	$3890.00	$5312.00	$8263.00
Net profit	$ 2.43	$ 780.00	$1947.00	$3928.00
Pounds of nitrogen gained	—1900	110	2280	5830

This table shows that under conditions in Illinois, system No. 4, is the most profitable and also best for the land. Perhaps with our conditions, such a rotation might not be the best, still, we should apply the same principles in comparing different systems for our own state. The profit from system No. 4 is 1616 times the profit from No. 1. What would it mean to the dairymen of Tennessee if they could increase their profits only one-tenth this amount by adopting a system which will yield more digestible nutrients per acre.

The Short Course begins January 1. It is divided, as usual, into four distinct courses, two of them running through January and two through February.

January 1-27. Agronomy: soils, crops, tillage, barnyard manure, commercial fertilizers, home-mixing of fertilizers, field crops, diseases and insects of crops, judging of corn and other cereals.

January 1-27. Live Stock: breeds of stock, feeds, management of forage crops, composition of food stuffs, feeding, nutritive ration, problems in making rations, diseases of live stock.

January 29-February 24. Dairying: dairy breeds, composition of milk, rations for cows, silos, testing cows, testing milk, making butter and cheese, separators, dairy machinery.

January 29-February 24. Horticulture: truck crops, hotbeds, coldframes, seedage, transplanting, small fruits, grapes, orchard fruits, orchard tillage, grafting, budding, pruning, spraying, harvesting.

As far as the subject will permit, every lecture will be illustrated by work on the part of the student. There is little textbook work, and

there is no time for fine-spun theories. The members of the Agricultural Faculty know the conditions in all parts of the state, from frequent service in farmers' institutes, and are thoroughly qualified to help in the solution of farm problems. No more profitable investment could be made by the farmers of Tennessee than would be involved in their coming or sending their sons to the Short Course.

MARKETING DAIRY PRODUCTS.

DAIRY EDITOR.

The producer of any commodity is always confronted with the problem of finding the best markets for his products. In fact, his success depends more or less upon his ability to handle this end of the business.

The subject of market dairying presents two very important aspects, viz., the production of better and more wholesome products, and the economical questions relating to the business, one of which is the marketing of the products.

Securing a Good Market.

As a rule it is easy enough to secure some kind of market, but it often requires considerable effort to obtain fancy prices. The first requisite is that the product be of superior quality. This is especially true of milk. Agitation in recent years for clean, pure milk has resulted in the placing of a high premium upon such milk. The public is becoming aware of the dangers which lurk in dirty, unsanitary milk, and is willing to pay handsomely for a milk the wholesomeness of which is unquestioned.

Value of Advertising.

Supposing we have products of a superior quality, the next essential is to bring the attention of the customers to the particular merits of the products. A good plan is to furnish prospective customers with a few free samples, and to distribute leaflets describing the conditions under which the articles are produced and handled. The lesson can be made more vivid by using pictures showing the conditions under which average milk is pro-

duced in contrast with those yielding sanitary milk.

Again, one of the best ways of advertising a superior product is by means of a trade mark. The name or monogram of the dairy placed upon the products or delivery wagon, guarantees genuineness and will materially assist in securing a better and more extended market. Then the use of letterhead stationery is not only businesslike, but it also helps to advertise the business.

When starting in the dairy business or trying a new market, it is often not a good policy to ask very high prices at the beginning. First demonstrate the merits of your product, and if they are of a high order consumers will gradually respond to demands for increased prices rather than lose the products. It is also good business policy to investigate the honesty and commercial standing of the customers before the accounts run up very high.

Make your product to conform to market demands. Always put yourself in an **Attitude to Please.** If criticised concerning your products, you cannot afford to resent, but try to discover the trouble and remedy it. Deliver a uniform product from day to day, and be punctual in the time of delivery.

Form of Product.

The form in which the product should be sold depends upon the nearness to market, the market demands, and the prices. Near large towns a good local market can generally be secured for all the products of the dairy. But many good dairy farms are to be found at a considerable distance from a large market. When it becomes necessary to ship the products for a considerable distance, it is generally more economical to sell either cream or butter. When located near a good market for all dairy commodities, the dairyman is naturally confronted with the problem of which form of product will yield the largest returns. This of course, will depend to a great extent upon the relative market prices and the cost of handling and delivering the different products.

The following table by Michels shows the price at which cream and butter must be sold to give the same returns as milk.

Per cent fat in milk	When milk sells at per quart	20% cream must sell at per quart	30% cream must sell at per quart	Butter must sell at per pound
4.0	5c	22c	31c	44c
	6c	27c	38c	59c
	8c	37c	50c	73c
	10c	46c	66c	93c
5.0	5c	18c	25c	35c
	6c	21c	30c	43c
	8c	29c	42c	59c
	10c	37c	53c	75c

In these calculations skim-milk and butter-milk were valued at 30 cents per 100 pounds. The amount of fertility sold off the farm is considerably more, however, in marketing milk than in selling butter or cream. Then again if whole milk is sold, the calves cannot be reared so economically, and hence the herd will not be so well maintained. This table, however, emphasized the importance of selling milk on the basis of its fat content.

HOGS AS AN ADJUNCT TO DAIRYING.

By JOHN L. HINSHAW, '13.

Many dairy farmers are located so they cannot market their skim milk at a profit. In order for the farmer so located to get the most out of his dairy, he must convert the skim milk into profit at home. Of course the calves will profitably use some, but they cannot use all. If this supply of skim milk is fed to hogs it will pay large returns.

If the herd comes fresh in the fall, the calves will use a greater part of the milk for a few weeks; but as they are thinned out and only the best kept for the herd, and these begin to consume other feed, the amount needed by them will decrease.

Value of skim milk for hogs.

Different Experiment Stations have carried on experiments to find the value of skim milk as a hog feed. The Connecticut Station found that it took 2,739 pounds of skim milk to produce 100 pounds of gain when fed alone. But when in a ration of 12.5 pounds of skim milk and 3.2 pounds of grain, 935 pounds of milk and 233 pounds of grain produced 100 pounds of gain. At the Wisconsin Station it was found that when skim milk was fed in the ration of three pounds of milk to one pound of grain, the best results were obtained. Five pounds of skim milk being worth one of corn meal as a feed. Indiana Station gives the money value of skim milk from 15c to 75c owing to the ration of grain fed, and age of animal.

A rule, given by Hoard, to find the money value of skim milk when fed alone, multiply the price of the live weight of hogs in cents per pound by 5; if fed in connection with corn or barley multiply it by 6. Butter milk has the same feeding value as shim milk.

Feeding the Hogs Skim Milk.

Suppose the pigs are farrowed in September. By the time they are three or four weeks old they should be taught to eat sloppy food. Skim milk and ground grain make the best starter for them. They should be weaned by the time they are ten weeks old and should weigh from 30 to 40 pounds each. When the calves are turned on grass the supply of milk for the pigs will increase. Always feed the skim milk in connection with some grain, as it is rich in protein and needs a starchy carbohydrate supplement. Furnish the growing pigs with good pasture, this not only keeps them supplied with green forage but is of great importance in giving them exercise.

Number of Hogs Needed to Consume Butter Milk and Skim Milk from 20 Cows.

Suppose we have a 20-cow dairy where only the maintenance of a herd of 20 cows is desired. Each cow gives 6,000 pounds of milk that has four per cent butter fat. This would give 96 pounds butter milk and skim milk to the 100 pounds. But to allow for waste count it 90 pounds, then each cow will produce 5,400 pounds of skim milk and butter milk, or 128,000 pounds for the entire herd. One calf will consume about 13½ pounds of skim milk for one pound of gain, and will gain an average of two pounds per day for

the first 120 days. We have the calf consuming 3,120 pounds of milk in 120 days. Eighteen of the calves are sold at six weeks, and two are kept for the herd. This is equivalent to keeping seven calves for 120 days. We see that the calves will consume 21,840 pounds of the skim milk and will leave 86,120 pounds of skim milk and butter milk for the pigs.

The pigs, when weaned, should weigh 35 pounds. For the first 100 pounds of gain will consume 575 pound of skim milk when fed a ration of three parts milk and one part grain. For the second 100 pounds of gain they will consume 625 pounds and make an average gain of one pound per day. If a pig weighs 35 pounds when it is weaned at ten weeks, and gains one pound per day, by the time it is 270 days old, it will weigh 235 pounds and will have consumed 1,200 pounds of skim milk and butter milk. Divide 1,200 into 86,160 and we have 72, the number of pigs. Cut this down to 60 to allow for losses in any way. We find that we need about five brood sows.

The sows should farrow again in March. By the time that the September pigs are finished off the young pigs are ready to take their places as skim milk consumers. The pasture should be in such a rotation that there is a good supply of green forage all the time. Rape may be sown early in the summer and should be ready in eight to ten weeks. Sorghums also furnish good summer pastures. Cow peas or soy beans and corn are excellent forage crops.

Finishing the pigs for fall market.

As the summer advances, and it is late in the lactation period, the skim milk supply may become low. Do not let the pigs stop growing on this account, but have good forage crops for them. Have a good crop of soy beans and corn for them to "hog off." Soy beans alone produce soft pork, but with a good balanced ration of soy beans, corn and rape, the meat will be firm and the gain rapid.

BACTERIA IN MILK.

By C. M. HAENSELER, '14.

If the farmer boy comes to his father bringing the news that neighbor's cow is in the field, the father will undoubtedly ask: (1) Is she doing any damage? (2) Where did she get in? (3) How can we get her out and keep her out? Just so it will be if the farmer is told that bacteria are in the milk; he will want to know what harm they are doing, how they get into the milk and how they may be gotten out and controlled. These questions will be briefly answered by giving (1) the effect of bacteria upon milk (2) sources of bacteria and (3) controlling of bacteria.

I. Effect of Bacteria upon Milk.

It is a well known fact that milk, if left under ordinary conditions for a week or more, will undergo several very marked changes. The most common of these and usually the first one to occur is souring. If sour milk is left for several days in

a warm place, another and quite different change will occur. Bubbles filled with gas will rise to the surface and a distinct alcoholic fermentation sets in. After several more days the milk will begin to give off a very bad odor, showing that putrifaction has begun. It is also a very common fact that butter undergoes changes which alter its flavor materially.

All of these changes which occur in milk and butter are caused by a very low order of extremely small plants called bacteria. Different bacteria give different effects; however, it is not always the case that each kind of bacteria brings about a different kind of change. Often a great number of varieties work together in bringing about one result. For example one group, containing about twenty-five different varieties, has the power of changing the sugars of milk into lactic acid thus causing the milk to become acid, or as is commonly called sour. The lactic acid bacteria, as these are called, are the most common ones found in milk, and, under ordinary conditions, are the first to cause a change in it. They multiply so rapidly that the milk which contains them soon becomes sour on account of the lactic acid produced by these bacteria. The acidity of the milk continues to increase as the number of bacteria and the length of their working period increase. However, the amount of acid in milk is not unlimited. The acid bacteria become inactive in very sour milk, .8 to 1 per cent of acidity being as much as they can bear. For this reason, when milk reaches .8 to 1 per cent of acidity, the lactic acid cease to multiply and therefore the milk remains at a constant degree of sourness.

This sour milk, although the lactic acid bacteria are inactive, will not remain long as it is. Other bacteria that are adapted to an acid medium and were inactive during the sweet stage of the milk now begin their work. There are a great number of these that feed upon the albuminoids, such as casein and other porteid materials of the milk, causing a putrifaction of these parts.

There are other groups that feed upon the albuminoids which do not grow in an acid medium. These are not noticed under ordinary conditions since the lactic acid bacteria usually gains the ascendency and sour the milk before the former gain a foothold. But this group can stand a much lower temperature than can the lactic acid group, so they often become very numerous in milk that has been kept at a temperature too low for the development of the lactic acid bacteria (40° F.) It is often the case that milk kept at a low temperature for some time becomes bitter and has a bad odor. This is due to the waste product of these putrifactive bacteria.

Another important group of bacteria is that which causes old butter to have a rancid taste. This group attacks the fats, converting them into butyric acid, which gives the butter the peculiar flavor. There are quite a number of other bacteria, which are very important in butter and cheese making, the good flavors of butter and the characteristic

flavor of the various cheeses being due to them.

In addition to the above, there are yet others that are found only locally or periodically. A very important one of these is that which causes stringy or ropy milk. This group can flourish at a much lower temperature than can the lactic acid group, but is not suited to an acid medium.

There are also occasionally, disease germs found in milk. Those most frequently found being tuberculosis, typhoid, diphtheria and scarlet fever germs. These bacteria are probably more important than any of the others, but all the bacteria in milk are important.

II. Sources of Bacteria.

The sources of bacteria in milk are very numerous. These organisms are so extremely small that they can find lodging almost anywhere. The dust in the air carry myriads of them. On the barn floor, feeds, bedding, cow, and almost everywhere they are found in great numbers. Even in the milk pails that have been thoroughly cleased with cold water, and apparently are absolutely clean, are large quantities of bacteria. It is quite evident, then, that if milk were drawn from the cow practically sterile, it would soon swarm with bacteria.

The milk from healthly cows, when drawn, has very few bacteria in it and those that are present are usually harmless; but, in unhealthy cows disease germs may find their way into the udder, and it is often the case that tuberculosis germs are in the milk drawn from cows suffering of that disease.

The greatest infection that milk receives occurs during and soon after milking. At the time of milking, dust from the bedding and feed is flying around in great quantities, much of which settles into the milk. Dirt and hair from the cow and probably some dust from the milker's clothes enter the milk. All of these particles are loaded with bacteria.

The disease germs, which are more localized than the more common milk bacteria, are usually carried by the milker, after having been attending a patient; or by flies, going from the sick room to the milk pail; or by the cow, receiving the germs while standing in stagnant ponds.

III. The Controlling of Bacteria.

The methods used by many dairymen allow infection from many or all of the above sources. This should not be. As shown by results of experiments carried on at the Virginia Experiment Station the number of bacteria in milk may be decreased to three-fourths or one-half of the usual number merely by moistening the bedding slightly and cleaning and dampening the cow's flanks and udder. If the feed is put in after milking and other precautions taken to prevent a dusty air at milking time, the bacterial count of the milk will again be lowered considerably. If, in addition, the utensils are sterilized, the barn floor and milk house cleaned daily, the cows kept clean and prevented from getting into mires and stagnant ponds, fairly pure milk may be obtained.

Such milk will be fairly pure when set aside but it must now be kept pure. With all precautions to keep the bacteria out, there will anyway be quite a number present. On account of their extremely rapid

multiplication, milk with only a comparatively few bacteria in it may, under certain conditions, after twenty-four hours be swarming with them. It is evident then that if pure milk is desired, the growth of these bacteria must be checked as soon as possible.

Most bacteria flourish and multiply rapidly at a temperature of 75° to 100° F. Very little growth takes place above 100° or below 40° to 50° F. Since milk, as drawn, is just at the temperature which favors most rapid multiplication, it is of great importance that milk be cooled down to 50° or below as soon as possible. A delay of an hour may increase the number of bacteria greatly. These low temperatures, however, do not prevent their growth entirely. Lactic acid bacteria growth almost entirely ceases at 40° F., so milk will not sour if kept at this temperature; but, as we have seen, there are other groups which continue their growth, and which will, by the waste products they throw off, cause the milk to become bitter or have a bad odor.

Temperatures over 100° F., may also be used to check bacterial growth, but since the low temperatures are more easily controlled and kept continuously they are much more used. However, high temperatures may be very successfully used for killing bacteria. If milk is heated to over 180° F., almost all bacteria are killed, but such high temperatures are seldom used, on account of the cooked taste they give to the milk. If heated to 160°-165° the flavor is not injured and most of the bacteria are killed. Milk after being so treated must be lowered to 40°.

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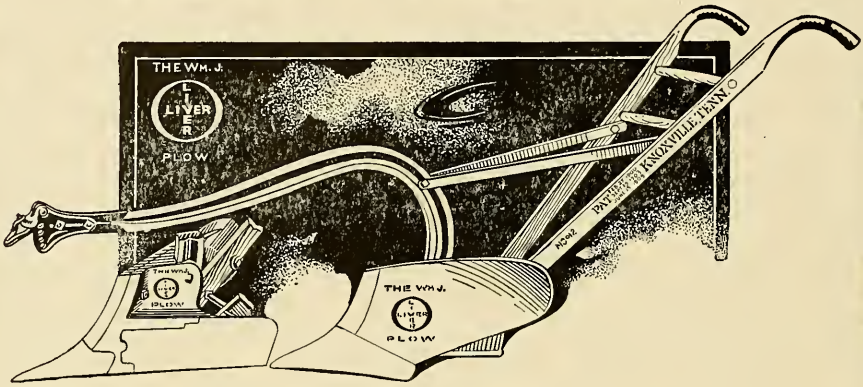

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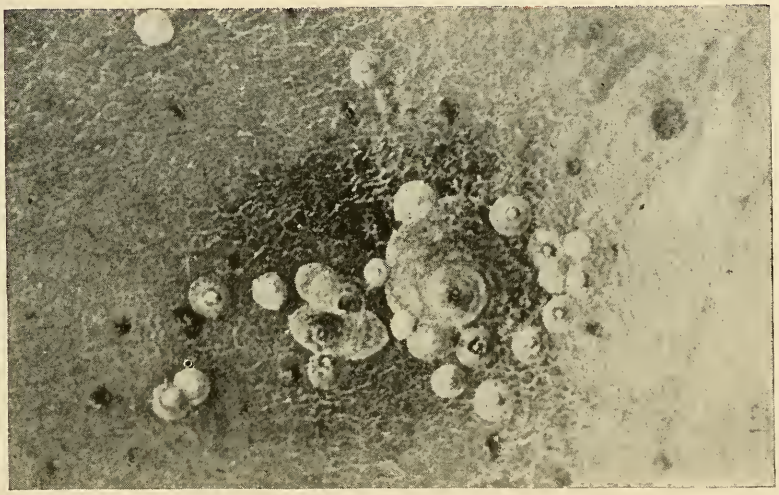

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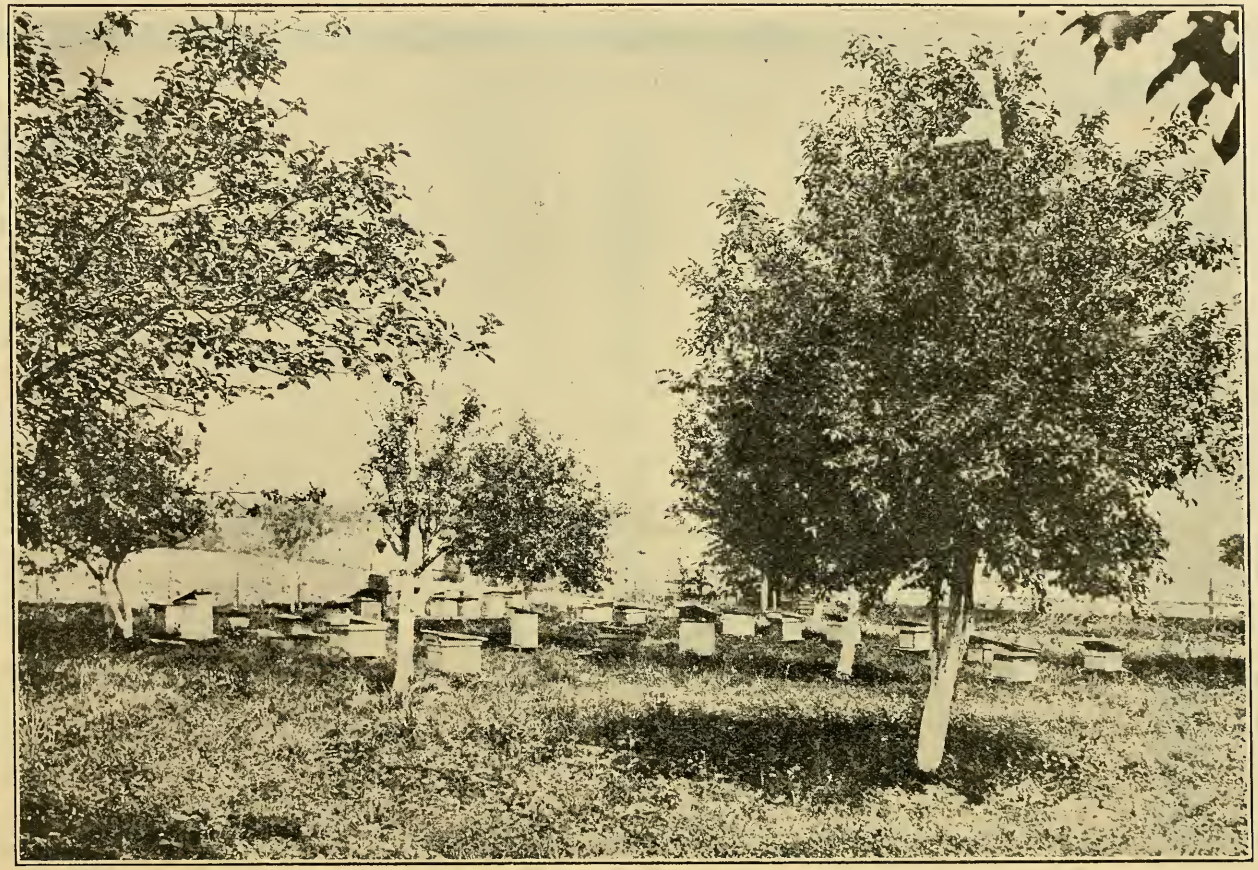
I H C Service Bureau

The Bureau is a clearing house of agricultural data. It aims to learn the best ways of doing things on the farm, and then distribute the information. Your individual experience may help others. Send your problem to the I H C Service Bureau.



APIARY AND ORCHARD.

THE U. T. FARMER

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APPLES FOR TENNESSEE.

J. U. GILMORE, '15.

Nearly every farm, large or small, in Tennessee has some sort of apple orchard. The cows may have eaten most of it but occasionally a few nice fellows are found on a top-most branch. Within the past few years many changes have appeared in the orchards of Tennessee. New orchards of improved stock are being planted and quite a few are being correctly pruned and brought back to a high state of productiveness. This being the case, there are now only 42 of our 96 counties in which there are apple orchards of ten acres or over. What are the reasons for this? Possibly the farmers know exactly how to select an orchard site, how to plant, what to plant, and how to cultivate and protect an orchard. We will try to give a little practical information about the starting of a good orchard in Tennessee.

Convenience to market, freedom from frost and the adaptability of the soil to the trees are the controlling factors in the selection of an orchard site. As a rule, we know that rich land is freer from late spring frosts than is low land, and the soil is necessarily better drained. The worst site that can be chosen is a cup-shaped valley, where the cold air can settle. As regards soil, the apple is the most adaptable of orchard fruits. This does not mean though that apples will succeed on any deep-gullied red hill you choose to plant them on, but a deep limestone foundation will very nearly fill all requirements. Depth and drainage are to be looked for and a clay soil has an advantage over one that is sandy. Other considerations of site are: ease of cultivation, a gentle being preferred to a steep hillside; a convenient water supply to facilitate the necessary spraying; and proximity to a small town or village where additional aid for harvesting may be secured.

Only ten varieties from among nearly 1000 recognized varieties are grown commercially in Tennessee or in the United States. We can tell a good market variety by the demand for it; the way it will keep and ship; and its resistance to diseases.

The Tennessee apple-grower can not compete successfully with the Northern grown winter apples. Hence he should try early apples. Probably the best early apples that will grow well throughout the state are the Yellow Transparent, Early Harvest and Red June.

Too many orchards fail because they did not have a fair start. Choose vigorous one-year trees, they are better than three-year-olds,

and fewer roots are lost in digging. If it is possible, go after the trees yourself and see that they do not become injured in any way by transportation Or if you receive them by freight or express, the package should be opened at once and the young trees "heeled in," until time for planting.

As a general rule we find that apple trees are set too close. Wide spacing insures plenty of room for the roots to gather plant-food. Tilling and spraying can be carried on better and easier, as well as plenty of air and sunlight being admitted. In gathering the fruit, good distance will be quite a help. To come to the point, apples should be from 28 to 36 feet apart each way. On a steep hillside the trees should run in parallel rows up and down the slope, while in the other direction they should follow the hill and all the trees of one row be on one level. Alternate planting can be used on a gentle slope or on level ground.

And now we come to the actual planting of the trees. Put them one inch lower than they grew in the nursery, see that the bruised roots are cut off, the surface soil fined and placed next to the roots; and the dirt well packed about the tree. Then you will be giving the young apple tree a fair chance.

For a few years we can grow crops of cotton, potatoes, tomatoes, melons, cow peas and soy beans in the orchard. All are clean tillage crops and the fertilizer given them will also help the trees. These crops will be a source of income to the farmer until the apples begin to bear.

It has been found eminently successful to use a cover crop on the apple orchard during the winter. Rye, vetch or crimson clover being the best winter catch crops, while in summer if the land is poor, cow peas can be grown. The cover crop should be turned under the next spring.

Tillage crops can continue to be grown until the trees become large. In low lands plowing and discing should be done every year and in steep land, where a good stand of grass and clover can be secured, it is a good practice to seed down the orchard and every summer, cutting the grass and letting it rot.

SPRAYING.

RUFUS H. FELTS, JR., '12.

The growing of fruit as a commercial proposition received its greatest boom upon the discovery of effective means of controlling the insect pests and fungous diseases which are so destructive to the various orchard crops, and no feature of our horticultural work has caused more interest than the protection of fruit crops.

It was not until about 1876, that effective insecticides were discovered, and this was through the discovery by Le Baron, the state entomologist of Illinois, of the value of Paris green in controlling the potato beetle, and at this time he suggested that such means would also prove effective in controlling the damages of the canker worm.

In the spring of 1878, an orchardist in New York State applied Paris green to his trees, and the same year Prof. J. L. Budd used London purple in an orchard in Iowa, both finding that there were fewer wormy apples where the spray had been applied than where it had not. Owing to the skepticism of the farmers the value of this means of preventing worminess was in an experimental stage until 1885, but after that it was accepted as the only

effective means of controlling the codling moth.

The practice of spraying to control fungi originated among the vineyardists of Bordeaux, France. This was quickly recognized by the United States Department of Agriculture to be an effective means of preventing fungous troubles, and the department together with the various state experiment stations has persistently and effectively prosecuted the work until at the present time spraying has come to be regarded as of vital importance to the horticulturalist, whether he be a commercial grower or a grower for home consumption only. However, it must not be supposed that spraying in itself will insure the production of a good fruit crop. It is only one of the several practices which are of fundamental importance in the care of fruit plantations. Tillage, fertilizing, and pruning are other cardinal practices in fruit growing and are none the less important because spraying has proven to be so essential.

Many fruit growers make no effort in spraying, and naturally suffer continual loss to their orchard interests. It is not necessary to know about all the pests, but it is necessary to know a few of the general principles that govern insect life in its methods of propagation and in its feeding habits. This information may be obtained from the state experiment stations and farm papers by every farmer who is really interested in the matter.

There may be some horticultural operations which will admit of indifference, but it is never so with spraying. It must be done at the proper time, with the proper material and with full knowledge and regard for conditions. To be successful we must know what to spray for, what to spray with, how to mix the material and the right time to apply the mixture.

Just at present Bordeaux mixture and self-boiled lime sulphur solution seem to be the most beneficial of the various fungicides which have been used and recommended. And arsenate of lead the most effective insecticide, having taken the place of Paris green for all orchard purposes.

Standard Bordeaux mixture may be made by the following formula:

Copper Sulphate (Blue stone), 4 pounds.

Fresh lump lime, 6 pounds.

Water 50 gallons.

The copper sulphate may best be dissolved by placing it in a coarse bag and suspending it in a tub or barrel containing a few gallons of water, allowing it to stand over night. Next morning it will be found to be dissolved and thoroughly mixed with the water. Slake the lime in a small amount of water, say 5 gallons; strain the lime into a third vessel, at the same time adding the copper sulphate solution, stirring vigorously; dilute to 50 gallons. Wooden or stone vessels must be used.

The one great drawback to Bordeaux is its injurious effects upon the foliage of the trees to which it is applied, due to the presence of the copper in solution. But it has been found by experiments at the Tennessee Station that solutions of Bordeaux containing smaller amounts of copper sulphate, about three-fourths to one and one-half pounds, are equally as effective in controlling the fungi and the injury to the foliage of the trees was so small as to be scarcely noticeable.

Self-boiled lime-sulphur is one of the newest fungicides, and has proven especially effective in controlling peach scab and brown rot. This mixture as used at the Tennessee Station may be prepared as follows:

Fresh stone lime, 10 pounds.

Sulphur, (flour or flowers). 10 pounds.

Water, 50 gallons.

Have 10 gallons of boiling water ready. Put the 10 pounds of lime into barrel and pour over it a bucket (2½ gallons) of boiling water. It should begin slaking immediately. As soon as the slaking is well under way sprinkle in the sulphur. Throw a sack over the barrel, and stir the mixture with a long paddle to prevent burning, adding boiling water if necessary. Allow it to boil exactly five minutes, then add enough cold water to make 50 gallons; strain the mixture into the spraying barrel and apply. This is considered by the Tennessee Station to be by far the most effective of all fungicides for peach diseases, and as a point in its favor it does not in any way injure the foliage or fruit to which it may be applied. For apples let the mixture boil as long as there is heat in the lime. When used in connection with arsenate of lead and applied in early spring it is effective both as a fungicide and an insecticide. The arsenate of lead should be used at the rate of 2 pounds to 50 gallons of the lime-sulphur solution.

It has been found advisable to make at least two applications of this mixture, the first at the time the petals fall and the second about 10 days later; and for late fall or winter apples a third application should be made about a month later.

It is well to make at least three applications of any spraying mixture during the year for codling moth and canker worm. The first just as the buds begin to show pink; second as the bloom falls; and third about 10 days to 2 weeks later.

In spraying for San Jose scale boiled lime-sulphur should be used. This may be prepared in the following manner:

Quick-lime, 21 pounds.

Sulphur, (flour or flowers), 18 pounds.

Water, 50 gallons.

Slake the lime in about 5 gallons of hot water; add the sulphur that has been made into a thick paste with water; boil, stirring frequently, for forty minutes to one hour; dilute all to make 50 gallons. While boiling add water from time to time to keep the solution thin enough to boil readily. Apply while hot. Stir frequently while boiling.

This solution must be applied when the trees are in the dormant condition, either in late autumn, winter, or early spring. Prune the trees before spraying and be careful to cover all parts of the trees thoroughly, and if necessary repeat the operation in a few days.

While it is advisable always to use the home mixed solutions on account of their greater efficiency and cheapness, there are some patent "scalecides" and fungicides upon the market which have given good results and where there are only a few trees to spray it does not always pay to take time to make the solutions. Many of these patent remedies are ineffective when used according to directions given on the packages, and if their strength is increased sufficiently to make an effective spray the cost is increased to from ten to fifteen times what the home-mixed sprays cost.

In order to get the best results from spraying it is necessary to make a careful selection of the spraying outfit, varying of course with the amount of work to be done. Where the orchard is small a hand power spray, which may be secured at small cost, will prove satisfactory, but in a commercial orchard it is advisable to use a power spraying outfit, and apply the spray under a pressure of 200 to 250 pounds. These power outfits enable one to do much more rapid and effective work, usually covering from five to fifteen acres a day.

BUYING FRUIT TREES.

F. W. HOWELL, '13.

Among the many causes that have led to failure in the growing of fruits in Tennessee, the indiscriminate method of buying trees has played quite a prominent part. In past years the most of the nursery stock has been supplied through the agency of the itinerant peddler, and as the object of the aforesaid peddler was altogether the selling of trees and not the improvement of orchard conditions, he quite often disposed of a very inferior grade of trees to the would-be fruit-grower. As a consequence the grower received as a reward for his work in preparing the soil, setting and careing for the trees, a few scur, knotty apples, instead of the untold bushels of luscious fruit promised by the peddler. There is small wonder then, that the grower, having to contend with the dishonest peddler and with the many diseases that trees are subject to, become discouraged and denounced fruit-growing as a delusion and a snare.

But within recent years there has

been marked improvement in orchard conditions over the State, due to the energetic work of the State Entomologist and the men of our Horticultural Department in the inspection of nursery stock and in studying the varieties best suited to our soil and climatic conditions.

After the fruit-grower has selected his orchard site his first consideration should be the kinds of fruit he can grow to best advantage, or, in other words, the varieties that will reach their fullest and most perfect development under his conditions. If he is raising fruit merely for his own use, he may be governed largely by personal preference, but if planning a commercial orchard, he must study the demands of the market and try to meet them.

The following varieties have been recommended for Tennessee: Early Apples, Yellow Transparent, Early Harvest, Red June, Lowland Raspberry. Fall and winter: Grimes golden, Rome Beauty, York Imperial, Ben Davis, Winesap. The early varieties are preferable except in the highest locations in the state, and there winter cold storage varieties such as, Grimes Golden and Delicious are recommended.

Cherry (Sweet) Gov. Wood, (Sour); Montmorenci Ordinaire, English Morelle. Peaches: Greensboro, Carman, Belle of Georgia, Elberta.

After deciding just what varieties he wants the grower should next find some honest responsible nurseryman who has them. In buying it is best to select one year old trees for the following reasons: They are cheaper, are just as vigorous as older ones, and there is not so great a loss of the root system in digging.

Then only first-class trees should be selected. They should have good shape, with straight smooth trunks, should show vigorous growth and be free from diseases. The buyer should be sure that the nurseryman has a "health certificate" for his trees, showing that they have been inspected by the State Entomologist and found in a healthy condition.

Before setting the trees they should be closely examined for signs of Hairy Root and Crown Gall. These diseases are found on the roots and their presence might not be detected by the inspector when the trees were in the ground at the nursery. Hairy Root might be recognized by bunches or tufts of very fine hair-like roots appearing on the diseased tree. Crown Gall makes its appearance in the form of little knotty tubercules or galls that may vary in size from small nodules up to the size of a walnut, or larger, Trees found to be injured by these diseases should not be set, for at present there is no satisfactory treatment for them.

There is a state law which says "that it shall be unlawful for any grower, nurseryman, florist, dealer or corporation to ship, sell, or deliver within the state any trees or plants of whatever description, without having been previously inspected by the State Entomologist and Plant Pathologist, or his authorized assistants and a certificate placed upon each bundle, package, bale, box or carload of shipment."

As a result of the efforts on the part of the Experiment Station and the passage of laws governing the sale of trees within the state, conditions are improving.

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Scientific; therefore practical

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EDITORIAL.

Most of the profitable orchards of our country are plowed in the early spring and cultivated until mid-summer. This is the season in which the trees make their growth of new wood. The plowing, pulverizing, or the retention of a dust mulch conserves moisture, thus making available the plant food in the soil, and stimulating growth. After cultivation is discontinued, the new growth will ripen, become hard and in a condition to pass through the winter without injury, however, this would not be the case if the trees grew until late in the fall.

Often at the last cultivation, it is well to sow something for a "cover crop" on the land during the winter and spring. Furthermore, if no crop is sown, weeds will produce a cover, but this is not desirable.

Some of the advantages afforded by orchard cover crops are as follows:

They require much water for their growth. This decreases the water supply of the tree, hence stopping new growth and ripening the old.

Again, the cover crop having an abundant root system will prevent, to a great extent, the winter and spring washing of the rich top soil.

Orchards are generally deficient in humus forming material and humus, cover crops such as clovers, vetches and as a matter of fact all leguminous crops possess the ability of obtaining nitrogen, the most important plant food element, from the air, of storing it in their roots and finally, becoming available as plant food in the soil.

In order for a plant to be suitable for an orchard cover crop, it should be vigorous and grow rapidly in the fall, it should stand much tramping which is especially necessary at packing time. It should be as near drouth proof as possible, grow vigorously in the spring and should be of a nitrogen gathering variety.

Since the Tennessee farmer has

at his command such a great variety of leguminous crops,—he can adopt, by experiments of his own or upon application to the Experiment Station, a cover crop or crops suitable to his own climate, soil and other possible conditions.

The grafting season is now at hand. If preparation has not been made for the grafting work, we should get busy and purchase or obtain in some way the cions or switches that we wish to propogate by this method.

It is a well known fact that fruit trees will not always come true to seed or type. This being true, twigs of known or tried varieties can be grafted on to the stocks of seedling and the desired results obtained.

Then, too, some varieties are more susceptible to diseases than others, however, there is no variety immune to all diseases. To the root stocks of the disease resistant varieties the twigs of the better fruits can be grafted—the outcome of this operation is a healthy tree that will live, perhaps ten or more years longer than the susceptible tree.

Many orchard sites are so rolling that it is necessary to seed them to grasses and clover. This can in turn be mowed; allowing the hay to remain as an organic mulch over the ground. This system of orchard management increases the soil fertility and prevents washing. However, the subsoil will eventually run together and prevent the storage of large quantities of water. A good and practical way of avoiding this difficulty would be to use about a half of a stick of dynamite in four foot holes, equidistant from the trees. The explosion loosens the subsoil, thus forming a reservoir for water conservation and retention.

Try it on the steep hill-side!

In order to prolong the life of an orchard and to make it more profitable, it should not be neglected. The pruning should be done before or during February. While pruning, the methods of fruiting of the different trees and vines should be kept constantly in mind. The old wood of the apple tree should not be removed because it fruits on spurs two, three and four years of age. The peach fruits on the wood that is a year old, however, many of the year old twigs may be removed to advantage. The grape fruits on the new canes that grow this spring—therefore, by pruning back the old canes, a large growth of even fruiting cane may be obtained.

The water sprouts, crossed and rubbing branches should be removed from all orchard trees. An open crown is well for the peach. The apple needs the branches thin enough to admit light to all of its parts.

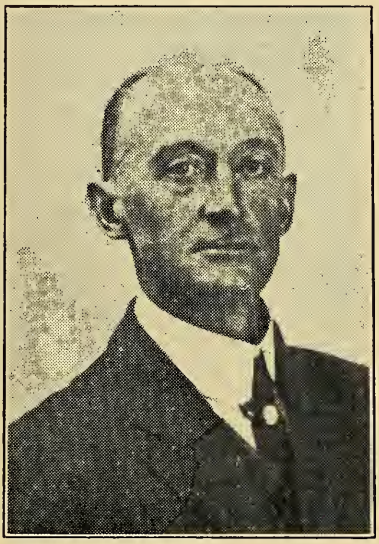
The Short Course in Dairying and Horticulture at the University of Tennessee begins on January 29th and lasts until February 27th.

Lectures are given in the forenoon and demonstrations or practical work in the afternoon. Pruning, grafting and interesting plans of the garden and orchard are formulated.

In order to obtain up-to-date horticultural information, in a limited amount of time, come to

this course. You may gain knowledge along all horticultural persuits, carry it back to your community, put it into practice and become a "shining light" there. A great opportunity, do not let it pass you by!

Dr. J. F. Stansbery is a member of the progressive firm of Duroc-Jersey Swine Breeders, known as S. H. Stansbery & Sons. He was



born in 1874, on the same farm which represents their now famous breeding establishment, located near Newport, Cocke County, Tennessee. Although having been in the swine breeding business only ten years they have already gained the distinction of being the breeders of the renowned boar, Volunteer No. 32899, that won the grand-championship of the International Live Stock Show in 1911. They sold this boar only two weeks prior to the show, for one of the largest prices ever paid for a boar south of the Ohio River. This same firm raised Colonel King, who is now heading one of Kentucky's famous Duro-Jersey herds, also Model Cherry now at the head of McKee Bros.' herd at Versailles, Ky. Dr. Stansbery recently demonstrated his true live-stock improvement spirit by presenting to the Tennessee Experiment Station his good, young boar U. T. Chief, that won the grand championship at the Tennessee State Fair, held at Nashville in 1911. The boars of unusual merit now owned by S. H. Stansbery & Sons are the following:

Tennessee Colonel, universally recognized as one of the best Duroc-Jersey boars living today. Chief Cherry the sire of Model Cherry and U. T. Chief. They have recently added to their herd at a very large price, Lexington Chief the grand championship winner at the Blue Grass Fair, held at Lexington in 1911. That this great firm will make history for the Duroc-Jersey breeders goes without saying. Dr. Stansbery was recently elected a director in the American Duroc-Jersey Breeders Association.

SONG OF LABOR.

I love the plowman's whistle,
  The reaper's cheerful song;
The drover's oft-repeated shout,
  Spurring his flock along;
The bustle of the market man,
  As he hies him to the town,
The hallo from the tree-top,
  As the ripening fruit comes down;
The busy sound of the threshers,
  As they clean the ripened grain;
The husker's joke and catch of glee
  'Neath the moonlight on the plain;
The kind voice of the drayman,
  The shepherd's gentle call—
These sounds of pleasant industry,
  I love—I love them all. —Ex.

VEGETABLES THE YEAR ROUND.

R. R. BLAKE, '12.

With our varied opportunities, we may consider ourselves most favorably situated indeed. Our temperate climate, and abundant rainfall render possible the growing of nearly every kind of vegetable grown in the United States. The vegetable garden should return, and in most cases does, the largest returns of any equal area of the farm, and for this reason demands the best location, both as to convenience of accessibility because of its frequent use, and as to the aspect or lay of the land. Preferably, the garden should slope to the south or southeast and consist of a loamy well drained soil, although the latter condition may be largely righted by proper handling.

Below are found our most important vegetables grouped in relation to the edible portion of the plant.

Leaves: Chard is one of our best pot herbs but is little known and appreciated in this country. The broad, thick, leaf blades are used like spinach while the stalks and midribs are served as asparagus. Several pickings may be had from the rapidly growing plants. Cultural methods are similar to that of the beet.

Chive is a plant of the onion family, and produces dense tufts of slender, hollow leaves valued for seasoning because of the mild onion flavor. The plant is perennial and furnishes leaves throughout the summer.

Collards are a form of kale and are grown like cabbage. They withstand heat better than either of the latter and the leaves, when well blanched, are very tender and of delicate flavor.

Corn salad, an annual plant, valued for salad purposes, greens and seasoning, may be sown in late summer or early spring. The earlier sowing gives edible plants in February and March.

We have three forms of cress. The water cress is a perennial and finds a choice home along clean running brooks and springs. It furnishes delicate leaves the year round. Another form, the garden cress, is one of our best salad plants. It grows readily in any good garden soil and will produce leaves of edible size in three to four weeks. Spring and fall are its favorite seasons. The upland variety of cress is native to a great part of the United States and is perfectly hardy as a fall or winter crop.

The wild dandelion is frequently used as greens but is greatly inferior to the cultivated varieties. The latter should be sown early in spring and will furnish several cuttings.

Endive is a native of East India. This is a hardy annual and is especially adapted for salad purposes during the winter months. May be sown in July or August in soil suitable to the growth of lettuce. Blanching, to remove bitterness and render more tender, is practiced when used for other purposes than soups, stews, and greens.

Kale, a member of the cabbage family, is grown extensively for fall,

winter and spring greens. The leaves are improved by freezing.

Lettuce was highly prized by the Greeks and Romans as a salad. It is the most important salad plant grown in the United States and thrives best in the spring and fall months.

Mustard is used throughout the year for greens and is valued for salad purposes.

Parsley, one of our most beautiful vegetables for garnishing, is also valued for salads and flavoring. May be sown in spring or fall, preferably in a moist, fertile soil.

Sage is a shrubby perennial, used fresh or dried for flavoring meats.

Savory is grown for the flavoring properties of the leaves and tender stem-tips.

Spinach is regarded as native to southwestern Asia. It is sown in the fall for winter and spring greens. This plant is easily grown and is the most important crop grown for greens in the United States.

Leaf Buds: Brussel sprouts are a variation of cabbage. The miniature heads form in the axils of each leaf and are from one to two inches in diameter. This vegetable is most appreciated during fall and winter. The cultural treatment and use is similar to that of cabbage.

In the wild state, the cabbage plant is found on the sea cliffs of western and southern Europe. It has been known since earliest antiquity, probably generally used 2000 to 2500 B. C. The plant is indigenous to Europe and grows best in a cool, moist, climate but succeeds well in our section during spring and fall. May be stored away for winter and spring use.

Leaf Stalks: Celery is native to southern Europe, England and Asia. This vegetable was little known to American people as late as 1880. It is successfully grown in all parts of the United States. Plantings for summer use, may be made in May while June and July seedings produce good stalks for fall and winter. The plants may be ridged over where grown or stored away in a cool moist place for winter.

Rhubarb is used principally during the early spring for making pies and sauces although the stems are frequently canned for winter use. It is propagated from pieces of roots set either in the spring or fall. The plant does best in a rich soil.

Stems: Asparagus is indigenous to Europe and Asia and has been cultivated since 200 B. C. Fall planting is occasionally practiced, but the setting of the crowns in spring is universally regarded better. This is one of our most important vegetables as evidenced by its wide popularity. It is adapted to all temperate regions and in a deep, rich, moist, sandy loam, it finds a congenial home. In the fresh state, it is a spring and summer vegetable but may be canned or dried and serve the fall and winter tables.

Kohl-rabi is closely related to cabbage, but somewhat resembles the turnip in appearance. The edible part consists of the swollen stem immediately above ground. The cultivation is similar to that of cabbage and when cooked before the flesh becomes woody, kohl-rabi is superior to the turnip in edibility.

Flower Buds: The globe artichoke is planted in the spring although

they do not produce until the second season. The burs are the part of the plant used and should be gathered before the blossom appears. The bed is reset yearly by shoots from the base of the old plant.

Cauliflower is of European Origin and is the most refined and delicious member of the cabbage family. The heads consist of the shortened and thickened parts of the flower. It is less hardy than cabbage, and prefers a moist climate and rather warm weather.

Fruits: The bean originated in tropical Africa and was long used in America before it was generally cultivated in Europe. They possess high nutritive value because of the large percentage of protein and are soil improvers from their leguminous habit. Beans are canned largely and millions of bushels are dried for winter use. More widely distributed than any other cultivated vegetable.

Citrons are a type of watermelon with solid flesh which is used for preserves and sweetpickles. Cultivation, same as for watermelon.

Sweet corn is of American origin, developed from common field corn. By successive plantings it may be had from early summer throughout the growing season.

The cucumber has been cultivated in India 2000 years and was grown by earliest settlers in this country. Plantings may be made in spring on light sandy soils for early crop, but heavier soils are better suited to the larger yields of later crops.

Eggplant is probably native of the East Indies. It is generally grown in tropical countries and is an important vegetable in the United States. The fruits of this annual are variable in shape and color and are edible when one-third grown until the seeds begin to harden. The plant should not be set in the open until the garden is warm as it requires a higher temperature than any other of our vegetables.

Our muskmelon originated in southern Asia, but is now popular over the world. The garden is not complete without it. May be planted after danger from frost and will produce edible fruits from early summer to late fall.

Okra is a warm weather plant grown extensively for its fruit pods. These are used, in the fresh state, in soups to which they impart a pleasant flavor and mucilaginous consistency, and may also be dried or canned for winter use.

The pea is native to western Asia and is now represented by dwarf, half-dwarf, tall, smooth, wrinkled and edible podded varieties. It is one of our most important vegetables for early spring and midsummer. The plant will stand hard freezing.

Pepper originated in Brazil and is now grown in nearly all parts of the world. We have the hot and sweet varieties. The time of planting and culture is similar to that of the tomato.

Physalis or ground-cherry is very easily grown. The fruit is eaten raw or may be used for preserves and marmalade. Culture is same as for tomato.

Squash is believed to be native of tropical America. They are used in summer but principally in winter, in much same way as pumpkins, to which they are superior in many respects. They are stored away

with part of stem attached in a rather warm ventilated place. Cultivated same as muskmelon.

Tomato is native to South America. Was catalogued as an edible vegetable in 1818, and was grown in many sections in 1835. We have many varieties as, cherry, pear, red, yellow, etc. They are planted when soil becomes warm and may bear until frost.

Vegetable marrows are closely allied to the pumpkin, but are used when quite young and tender. They may be baked and served in same way as sweet potatoes.

The watermelon is native of Africa and has been cultivated since remote antiquity. They are grown most extensively in the United States. This plant requires a rather high temperature, long season and a sandy well stirred soil.

Bulbs: Garlic is a perennial and has a strong onion-like flavor. The bulb is the edible part. It is set in spring or fall and requires practically same treatment as onions.

Leeks are somewhat like onions, but the edible part consists of a sheaf of leaves instead of a real bulb. When well blanched they are milder and more tender than the onion. Culture, same as for onions.

The onion probably originated in southern Europe and has been grown since earliest history. It is one of the most important vegetables in the world and ranks third in importance in the United States, widely adapted to varying soils and climates and used for culinary purposes all the year.

Shallots are a form of onion consisting of compound bulbs called clover. They are some milder than the onion and require the same cultural treatment.

Tubers: The Jerusalem artichoke is used to some extent. They are planted in the spring and cultivated like corn. The tubers are ready for use in October, but may be gathered any time during the winter.

Irish potatoes are indigenous to Chile, Peru and Mexico. They are grown even more extensively in Europe than in the United States. Plantings are made early in the spring after danger from frost is past or for the late crop in the fall. They are placed in a dry cellar or buried in the open ground, for winter use.

Sweet potatoes are of a tropical nature and should be set in warm, loose, preferably sandy soil after warm weather begins. As they require good drainage, they are generally set in ridges. They are dug as soon as the leaves are nipped by frost and are stored in a medium warm, well ventilated place. This plant is native to the West Indies and Central America.

Roots: The beet is native to the sea coast of south Europe and has been cultivated more than 2000 years. Leaves are used as greens and roots for pickling and cooking. They do best as an early spring crop, but should be gathered before freezing in the fall.

Carrots have been cultivated in Europe 2000 years. They are planted in early spring, generally in ridges, and harvested in autumn and stored in pits or cellars for winter use. Horses relish carrots. They are adapted to a wide range of climatic conditions.

Celeriac is a large-rooted form of

celery and requires the same cultural methods. The roots are dug from the garden as wanted.

Chicory is a well known European vegetable. The roots are used like carrots or parsnips or when dried are used as an adulterant of coffee. The plant lives over winter and in spring sends up tender leaves which may be used as greens. Any soil adapted to other root crops will grow good chicory. Culture, as for parsnips.

Parsnips are an important root, closely related to parsley, carrot and celery. It is sown in ridges in spring and is ready to eat after maturity but the quality is improved by freezing.

The radish is indigenous to temperate regions of the old world. It may be grown from early spring to late fall. Edible size roots are ready in three to six weeks after sowing. May be stored for winter consumption.

Horse-radish is a hardy perennial and its use is well known. The roots are set in spring or fall and little cultivation is required.

Rutabagas are similar in composition and character of growth to kohl-rabi and requires practically the same cultivation. Flesh is richer than that of beet or turnip. Roots will stand some freezing and are used as a fall and winter crop. Sow in July for late crop.

Salsify is like to carrots and parsnips in habit of growth and cultural requirements. It may be sown in spring or later in summer for winter use. The roots can be dug in autumn and stored or allowed to remain in the ground.

The turnip originated in Europe or Asia. It may be grown as a spring crop but is most extensively sown as a fall crop for winter use. Turnips are quite hardy and will stand some freezing. After removing the leaves they are stored in cellars or pits like other roots.

From this number of plants, all of which are successfully grown in this section, it is an easy matter to select a rotation which will be sufficient to supply our tables throughout the year with an abundance of palatable and wholesome vegetables.

ORCHARD CONDITIONS IN TENNESSEE.

HORTICULTURE EDITOR.

Considering the reports gotten from a few of the average farmers, represented by students taking Agriculture at the University, of various sections of this state, fruit growing must be at a rather low ebb, as compared with one who practices orcharding as a profitable business. The following reports will show conditions as they exist now all over the state.

There is a seven-acre, old apple orchard situated on the Highland Rim in Overton County. It is on a slight northeast slope near a river and has a clay loam soil. About one-half of the old trees have died and been replaced by peaches and pears. The peaches have so far died at the age of 5 and 6 years, and scarcely bring any fruit prior to that time. The pears have in later

years been almost barren on account of the blight, but before that time—6 or 8 years ago—they yielded excellently. The apples are of early summer and fall varieties. They seldom fail to yield enough for family use. There is no pruning and spraying, and the orchard is cultivated with ordinary farm crops. Another is a peach orchard in same locality, situated on the north slope near to the top of a mountain, about 400 feet above the average level. It contains about three acres. At this place there has been no remembrance of a total failure of fruit. It has a rocky, sandy loam soil, gets no care except cultivation in general farm crops, for the crop value and not orchard. Many of the older trees have died out and were replaced by young trees five years ago. The fruit is for family use. No market.

There is a ten-acre apple orchard located on the middle Tennessee upland. It has a very rich soil and on level land. It contains about 300 apple trees, most of which are Ben Davis, Kennard's Choice and Winesap varieties. About one-third of trees bear well each year. The orchard has no care except that it is turned each fall, and receives a thin application of manure every other year. It brings a total income of about $250.00 each year, by retailing the apples at 50c a bushel, and selling vinegar (4 to 5 barrels each year) at 40c to 50c a gallon and some cider at 30c per gallon.

In Green County, East Tennessee, there is a small apple orchard of about two and one-half acres of horse apples, Winesap and Ben Davis. It is situated on a north and east slope, and has a clay loam soil. The one-half acre of horse apples yield about 150 bushels per year. The rest of the trees have a good crop two out of every three years. There is no market, so orchard supplies family and neighbors. No care is taken of the trees. The orchard is cultivated by a rotation of wheat and corn for two years, and in grass another two years.

There is a small peach orchard in Knox County containing one acre having about 100 trees five years old. It has a sandy loam soil, on a northwest slope. It receives no pruning nor spraying, the borers were dug out the third year, the orchard is cultivated to general farm crops. It yielded 20 bushels in 1910, which were sold on local market at $1.00 per bushel picked from trees without grading. There is about one acre of summer and fall apples on the same place. The fall apples bear every year and receive no care, orchard is in grass. About 25 bushels are sold each year above family use at $1.00 per bushel in local market. There is another orchard in east end of county which contains about 3½ acres or about 75 apple trees. It bears enough fruit each year for family use, and has full crop about every three years. It is on a clay loam soil in a low place, and receives no care—is cultivated to general farm crops.

An old apple orchard of about 10 acres is located upon the Cumberland Plateau. It has a sandy loam soil and is situated on a northeast slope. It bears full crops every three or four years. About 10 years ago it yielded well and a small amount was marketed, but due to poor

market about all that was realized was for family use. It receives no care and is cultivated from year to year with general farm crops.

A 3½ acre peach, pear and apple orchard is located in the southern part of East Tennessee, one-half of orchard is in peaches, one-fourth to pears and remainder to apples. It has a sandy loam soil. The trees receive a winter spraying and usually one summer spraying, with the lime sulphur-boiled and self-boiled. There is no pruning done, and no cultivation. It is used as hog pasture set with sage grass and sassafras sprouts. About $100.00 was realized from 35 peach trees in 1910. Sold at Cleveland local markets. About $30.00 is made from the pears every other year.

In middle Tennessee is located a small orchard of old apple trees and peaches. The 2 acres of early apples bring about $50.00 above home use each year, and 1 acre of peaches bears every two or three years enough for home use. The orchard receives no care. It is cultivated chiefly to wheat, corn and grass. There is another orchard near same place containing about 10 acres of old apple trees which have been replaced by young trees where old die out. It has a clay loam and lays on level land. It receives no care, is cultivated by ordinary crops, and contains mostly summer apples which bear fairly well each year, the rest are winter apples. There are no sales, and home use is all that is realized.

One 10-acre apple orchard is located in Murray County, middle Tennessee. It is on rich hillside land sloping toward the southeast with a clay loam soil. The trees are about 12 years old. They have received no care except cultivation by a rotation of wheat, clover and corn. The only pruning done has been to cut lower branches off so as to make cultivation easier, close to trees. The orchard bears a good crop once in three or four years. About $100.00 worth of fruit has been sold from it, above home use, since it come into bearing. There is a small apple orchard near above location, which is on rich bottom land. It never fails to bear good crops. It receives no care except general farm crop cultivation. No marketing is done, but it furnishes plenty for home use.

One small orchard is located on the Cumberland Tableland, which has a sandy soil with a clay subsoil. It consists mostly of winter apples. It bears about every other year, plenty for family use as canned fruit and fresh apples for all winter. The orchard gets a little pruning each year, otherwise it receives no care. Is in permanent grass lawn. The trees are all free from scale insects, and in healthy condition.

A small mixed orchard in Henderson County, middle Tennessee, consists of apples, pears, cherries and peaches. It lays on a north slope and never fails to bear fall crop. There is no care given it above the average, and market is poor, hence family use is all that is realized from it. Several other reports show that a great many farmers only have a few trees in house and barn lots, which produce shade and a small amount of fruit in years they are not destroyed by frost.

The following report is of an or-

chard near Columbia, Tennessee, R. F. D. No. 6, owned by I. C. Murphy, one of the best practical orchardists in the state. This orchard contains about 40 acres of apples. About one-fourth are eight years old, 12 acres seven years old, 9 acres six years old and 9 acres five years old. The orchard has been cultivated to corn, potatoes, tomatoes, cantaloupes, and cotton. It has been sown to peas, soy beans, rye and vetch. All have given good results except the rye and vetch which was allowed to mature, it being a dry spring. The soil is a yellowish brown with a red clay subsoil. The land is rather rolling, but level enough to use power spray all over orchard, the varieties in orchard are: Yellow Transparent and Douchess with a few Early Harvest for summer fruit, and Ben Davis, Winesap and Yates for winter varieties. The summer and winter varieties are planted alternating in rows. The entire orchard is winter sprayed with boiled lime-sulphur, using large hand pump and barrel. In 1911, the 10-acre block of 8 year old trees was smugged with straw and trash. This saved the fruit in this block as about all the fruit in the seven year old block was killed. The 8 year old block was then sprayed just after the bloom dropped, and two weeks later with self-boiled lime sulphur diluted one to thirty with two pounds of arsenate of lead to 50 gallons of solution. It was again sprayed the latter part of July with lime sulphur alone, the early varieties were damaged considerably with the frost so that only 100 boxes was gathered from them against 600 boxes from the late varieties. The fruit is hand picked and handled in ordinary boxes of 45 pounds per box and sold on local market. The summer fruit averaged $1.00 per box, without having to grade fruit, and boxes returned. The Winesaps brought $1.50 per box and boxes returned. The Ben's averaged $1.35 per box. He has on hands now 113 boxes of Yates, which are now selling at $1.30, and 25 boxes of Winesaps well packed in coldstorage which will bring $2.00. There was also a loss of over 40 boxes of Ben's and Winesaps on account of carelessness of labor during proprietors absence, and about 20 boxes of Yates were frozen in the November cold spell, this was made to cider, and hence not a total loss. In spite of all losses the 10 acre block will net $75.00 per acre.

This ought to be sufficient proof that orcharding can be made profitable in Tennessee as well as elsewhere, where good methods are used. The day is at hand when fruit trees must be taken care of as well as other farm crops if any returns are expected.

ANOTHER NATURE FAKE.

The farmer had been taken to the art gallery. He stopped before a barnyard study.

"That picture isn't true to life," he said.

"What's wrong?" his host asked.

"Who ever saw a cow that wasn't flapping her tail?" he demanded derisively.—Buffalo Express.

MARKET GARDENING.

By J. N. GILMORE, '15.

Few States in the Union possess a better climate for growing vegetables than Tennessee. Our large cities demand enormous quantities of all kinds of garden produce every year. A great proportion of this is grown in the State, but more can and should be grown to supply an ever increasing population. Hundreds of carloads of cabbage, tomatoes, celery, lettuce, melons, onions and many others, are shipped here from all over the United States. No one doubts our ability to produce sufficient vegetables for early spring markets, as well as for the whole year, so far as climatic conditions will permit.

A person starting in this line of business must exercise great care in choosing a location. Nearness to a city is advantageous, as labor, manure and a short haul to market are obtained. A good road or else good shipping facilities should be thought of if he locates some distance from a city. For a soil, a good sandy loam should be chosen. Natural windbreaks of trees or hills protect early vegetables from frost.

In the preceding paragraph a sandy loam soil was said to be an ideal soil for a general line of gardening. The reasons why it is so good, are that it is very easy to till, it is early and the loam part of the soil will retain sufficient moisture for the growing plants. Sand is needed by the root crops, as parsnips, carrots, radishes and salsify can not grow well in any but a loose soil. Such vegetables as cabbage, cauliflower, sweet corn, tomatoes and peppers grow very well on clay or loam soils. Celery and lettuce thrive on reclaimed swamps. Drainage is a matter of great importance.

In raising some crops of vegetables the seed is planted directly into the ground, while for other crops the seed must be planted in hot-beds, cold-frames and green-houses. Here they are grown to a certain age and size, after which they are then planted in the field. Of course we take it for granted that any gardener knows how to build some form of cold-frame or hot-bed. Sedge grass mats are used to protect the beds when there is danger from frost. Some plants are taken from the hot-beds and set in cold-frames to harden, or to get used to more adverse environments. Certain classes of plants as tomatoes, cucumbers and peppers, are started in hot-beds and are then transplanted to cold-frames or they may be planted in the field without any transplanting.

Proper tillage is of the utmost importance in the growing of vegetables. Some results of proper tillage are, viz: (1) It puts the soil in proper physical condition for the foraging of plant roots. (2) It conserves soil moisture. (3) It induces chemical activity, thus facilitating such changes as are necessary in the preparation of plant-food. (4) It aerates the soil, helping friendly bacteria to increase. (5) It destroys weeds and is destructive to harmful insects. These are not all of the beneficial effects of good tillage,

but they give an idea of how much depends on tillage.

A great diversity of tillage tools are used by a gardener. They should combine efficiency, durability and ease in manipulation. A common mould-board two-horse plow, a single-plow, a disc harrow, a spring tooth harrow and plank drag should be on the farm of every truck grower. Cultivators, weeders and hoes are widely used.

We shall next consider the selling of vegetables. To do this properly you must study your market and grow only such articles as are in demand. Earliness is an advantage in obtaining good prices and making easy sales. Grade your fruit, a single bad specimen in the package may cause you to lose a sale. Cleanliness is important. Adapt a popular size of package and increase it as the prices become lower. The arrangement of the vegetables in the bundles should be as pleasing as possible to the eye. The market wagon should be neat, painted, the team and harness respectable, and the personal appearance of the salesman not neglected. The whole outfit will then command respect. Don't try to sell an article of produce until you know its value. If you have telephone communication with a city, why sell your load if possible before you leave home. It is then more easy to keep posted on the prices, and you will stand a good chance of getting a fair deal.

Many truck growers are extremely careless about following any kind of rotation in garden crops. A good rotation will put an end to some insects and disease. It may be true that certain crops, as onions and celery, are grown on the same land for years, without any rotation, and there are many instances where it is not advisable to use a rotation. But as a general principle the advantages of a rotation should not be overlooked, more especially with crops subject to the common diseases and insects. Closely related plants as cabbage, cauliflower and all other cruciferous plants subject to black-rot, club-root and other deadly diseases which are difficult to control, should not follow each other. It is also less difficult to control weeds if a rotation is practiced.

Another advisable method of cropping besides following a rotation, and one in general practice, is that of successive cropping. This is really intensive gardening, and is practiced on land of high value, where the area is limited. The smaller and more quickly maturing crops as lettuce, radishes, onions, beets, turnips and spinach, are grown in successive cropping. If the grower is familiar with the varieties and knows the time each requires for growth, he should have no difficulty in working out a cropping plan to follow. High fertility, timely planting, thorough tillage and prompt marketing, unite in making not only successive cropping profitable, but also assure the success of any method of market gardening.

SOY BEAN COOKERY.

Orchard and garden products do not furnish the only essential materials of food for the welfare of the human body. It is true that they provide much of the succulent and carbohydrate portions of our diet, however, a food containing protein is very essential. Meats have been considered the main source of nitrogenous or tissue building food, but as the price of meat continues to go higher and higher the demand for a satisfactory substitute for the tissue building food is becoming more insistent.

The Home Economics Department of the University has experimented with the beans and the meal and has found that very attractive dishes can be prepared from them.

The meal contains 20% of fat, so it needs very little fat in the dough nor is butter necessary in the eating of the bread.

There is 38% of protein-tissue food, so one can readily see how concentrated a food this is for no meat, our chief source of protein contains more than 25% of this tissue building element.

Muffins.

1½ cup soy bean meal.
½ cup flour.
1 teaspoon salt.
1½ cup butter milk.
½ to 1 teaspoon soda.
1 egg.

Beat the egg, add the salt, milk and after sifting the meal and flour together, stir them into the liquid. Desolve the soda in two teaspoonfuls of water and pour enough into the butter milk to make the mixture bubble. Put into hissing hot greased muffin rings and bake.

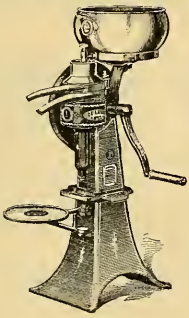
Boston Brown Bread.

1 cup flour.
1 cup soy bean meal.
1 cup butter milk.
½ teaspoon salt.
½ cup molasses.
¼ cup raisins.

Scald and seed the raisins. Sift the dry ingredients together. Add to them the liquid and raisins. Put into well buttered baking powder cans, cover and steam for three hours. Fill the molds only two-thirds full.

Facts About Apple Growing

The healthier the tree, the better the fruit. The longer trees are sprayed with "Scalecide," the more beautiful, healthful and fruitful they become. Mr. Geo. T. Powell, President of the Agricultural Experts Association, has used "Scalecide" exclusively for the past six years on his 160 acre orchard at Ghent, N. Y. He gets twice the price for his apples laid down at his Railroad Station that the growers do in Hood River. Mr. J. H. Barclay, of Cranbury, the acknowledged champion apple grower of New Jersey, has taken all the first prizes for the past four years at the New Jersey Horticultural Society meetings. He has used "Scalecide" exclusively for the past six years. Men who KNOW use "Scalecide." A postal request to Dept. A will bring you by return mail, free, our book, "Modern Methods of Harvesting, Grading and Packing Apples," and new booklet, "SCALECIDE, the Tree-Saver." If your dealer cannot supply you with "SCALECIDE" we will deliver it to any R. R. Station in the United States east of the Mississippi and north of the Ohio Rivers on receipt of the price; 50-gal. bbls., $25.00; 30-gal. bbls., $16.00; 10-gal. cans, $6.75; 5-gal. cans, $3.75. Address, B. G. PRATT CO., 50 Church St., New York City.



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European		American	
30 bushels	Wheat	14 bushels	Wheat
2 tons	Hay	1 ton	Hay
40 bushels	Oats	32 bushels	Oats
210 bushels	Potatoes	95 bushels	Potatoes

When we consider that these yields are obtained on land that has been cropped for hundreds of years, and that the European Farmer has practically doubled his yields per acre in the last 80 to 100 years, European Methods of Farming are of vital interest and importance to every Farmer and Student of Agriculture.

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15	Wheat	35	Gravel Clay	Columbus, Ohio
20	Wheat	40	Black Loam	Lindsey, Ohio
53	Wheat	33½	Black	Shadeville, Ohio
110	Wheat	28	Clay (farmed 80 years)	Duvall, Ohio

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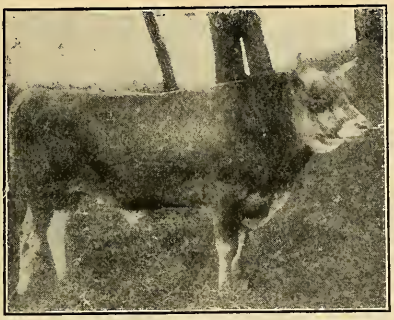

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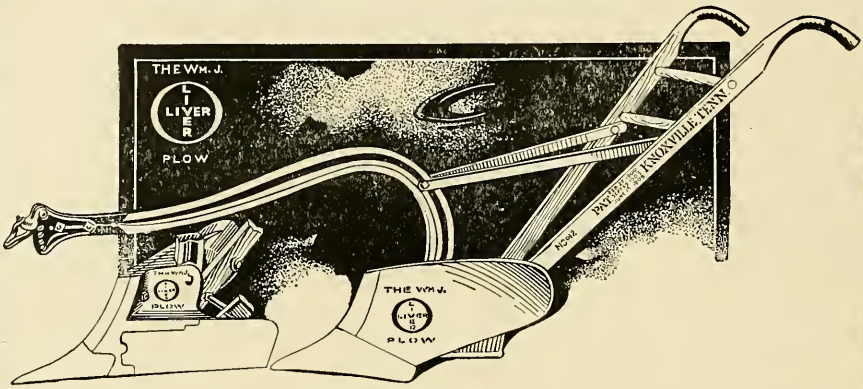

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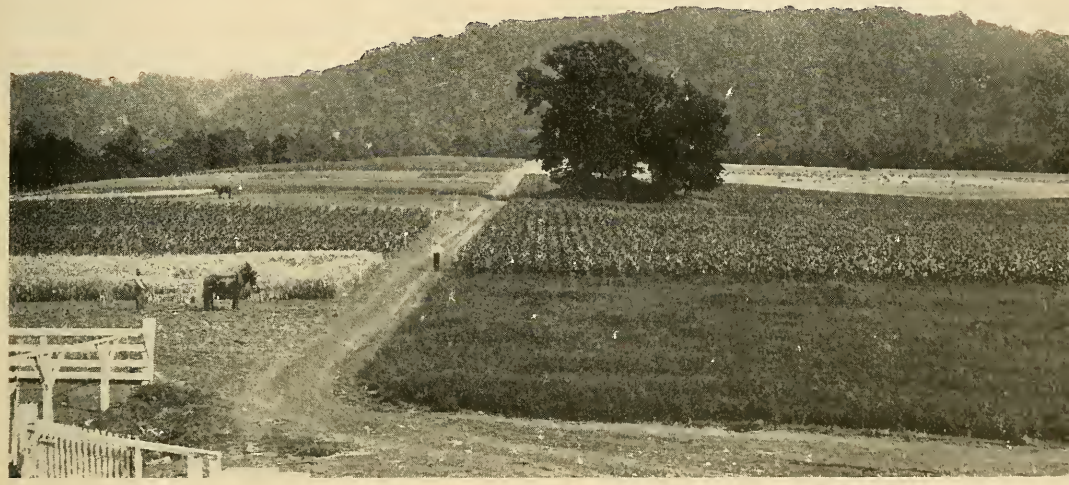

VIEW ON TENNESSEE EXPERIMENT STATION FARM.

Vol. VI. MARCH, 1912 No. 6

Published Monthly by

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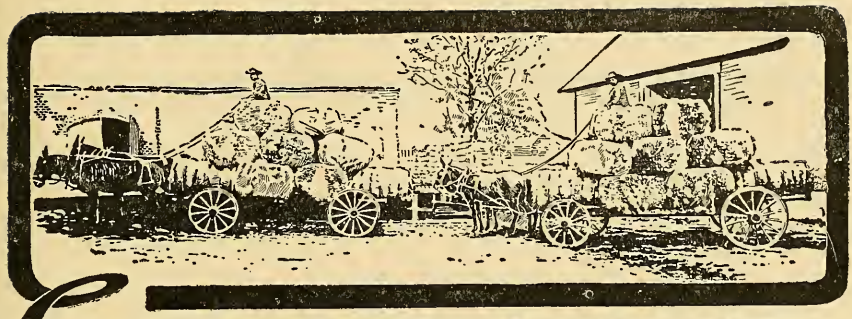

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IF

If you can keep your head when all about you
  Are losing theirs and blaming it on you;
If you can trust yourself when all men doubt you,
  But make allowance for their doubting too;
If you can wait and not be tired of waiting,
  Or being lied about don't deal in lies,
Or being hated don't give way to hating,
  And yet don't look too good, nor talk too wise;

If you can dream—and not make dreams your master;
  If you can think—and not make thoughts your aim,
If you can meet with Triumph and Disaster
  And treat those two imposters with the same,
If you can bear to hear the truth you've spoken
  Twisted by knaves to make a trap for fools,
Or watch the things you gave your life to, broken,
  And stoop and build them up with worn-out tools.

If you can make one heap of all your winnings
  And risk it on one turn of pitch-and-toss,
And lose, and start again at your beginnings
  And never breathe a word about your loss;
If you can force your nerve and heart and sinew
  To serve your turn long after they are gone,
And so hold on when there is nothing in you
  Except the Will which says to them: 'Hold on!'

If you can talk with crowds and keep your virtue,
  Or walk with Kings—nor lose the common touch,
If neither foes nor loving friends can hurt you
  If all men count with you, but none too much;
If you can fill the unforgiving minute
  With sixty seconds' worth of distance run,
Yours is the Earth and everything that's in it,
  And—wihch is more—you'll be a Man, my son!

—Rudyard Kipling.

THE U. T. FARMER

Vol. 6. MARCH, 1912. No. 6

SWEET CLOVER.

By W. K. TIPTON, '12.

Sweet clover is divided into two varieties melilotus alba (or white) and melilotus officinalis (or yellow). The white is also known by several other names as Bokhara and Tree clover. Sweet clover is originally a native of the semi-arid region of Asia. It made its way into Europe and from there was brought to America by the early settlers.

Sweet clover is considered by most people as a weed. Some states have legislation against sowing the seed or allowing the seed to mature. It is sometimes an annual and other times a biennial.

It is slowly gaining favor in the United States, especially in those sections where the land is worn out and badly eroded. It is a very hardy plant, growing in any kind of soil, loose or hard, damp or semi-arid, rich or poor. It can stand almost all degrees of temperature found in the United States.

Sweet clover is the strongest nitrogen gathering legume. Its large root system and its power to penetrate hard soils makes it valuable as a renovator for soils poor in nitrogen and in poor mechanical condition. The very habit of growth of sweet clover has won for it, in the past, the name of a noxious weed, but since we have learned its true value and the means of eradication we can look upon it with much less suspicion than in former times. To eradicate it we have only to prevent it from seeding. This can be done very cheaply with the mower and at the same time increase the pasturing quality.

Sweet clover in the past has had very little feeding value given to it on account of its bitter taste either as a pasture or as a hay crop. But now it is beginning to be looked upon as a plant of high feeding value with a bitter taste, which stock learn to like by being forced to eat it.

It compares favorably with the other clovers in feeding value and will grow upon land too poor for the other clovers. It has been recommended as a pasture for early lambs in the South. The lambs will soon learn to like it and gains will be made on it as fast as from other clovers. When pasturing sweet clover the mower should be run over it every few weeks so as to keep the plants that are not eaten off cut back to make them tender. The new growth is more palatable and should never be allowed to get over 10 inches high when being used for pasture. Sweet clover is also being recommended as a hog pasture, it should be treated in the same manner as for lamb pasture.

Sweet clover is higher in ash and crude protein than any of the other hays. The only difficulty is the question of palatability. To make the best quality of hay it should be cut just before the appearance of the first blocms. If it is let bloom it becomes very woody and especially if of rank growth.

The early cutting may account for the high ash analysis. It is good as a soiling crop for dairy cows. It is such a rapid grower and is less bitter when fed in a partially wilted condition.

The following table will show the digestible nutrients and fertilizing value of red clover, alsike, alfalfa and sweet clover.

	Digestible Nutrients				Fertilizing Value		
Variety	Total Dry Matter per 100 lbs.	Crude Protein per 100 lbs.	Carbohydrates per 100 lbs.	Fat per 100 lbs.	Nitrogen per 100 lbs.	Phosphoric Acid per 100 lbs.	Potash per 100 lbs.
Red clover ..	84.7	7.1	37.8	1.8	1.97	.56	1.87
Aliske clover	90.3	8.4	39.7	1.1	2.05	.50	1.39
Alfalfa	91.1	10.5	40.5	.9	2.34	.61	1.79
Sweet clover	92.1	11.9	36.7	.5	2.88	.56	1.83

This table gives more pounds of digestible nutrients per 100 pounds of hay than any of the other hays compared. It has a narrow nutritive ratio. The table also shows more fertilizing constituents than does the other clovers. The K_2O and P_2O_5 come directly from the soil in both cases. The analysis shows 54 pounds more nitrogen per 100 pounds hay for fertilizing value. Even though if all the hay is removed in each case we have a right to believe that the larger root system of the sweet clover has in proportion the same amount more nitrogen stored in its nodules than has the other clovers.

Sweet clover is good as a soil inocculator for alfalfa. A few scattering stalks in the young alfalfa are beneficial to it. Sweet clover being a much hardier and more rapid grower soon stores up a supply of bacteria in the nodules on its roots. The rapid cutting of the alfalfa will kill the clover in one year.

Sweet clover in bloom makes a choice bee pasture. It can be sown around in rough places or along the road side for this purpose. If part of it is cut back for a while in the spring it may be kept in bloom for several weeks. The honey has a beautiful color and excellent flavor.

At present sweet clover seed are expensive and very scarce. They can be had for about $9.00 per bushel, the yield of seed is about the same a red clover per acre. No special preparation is needed to sow the seed. It is best not to sow on too loose seed bed or they may get covered too deeply to come up.

The seed are sown with or without a cover crop. They can be sown in corn at the last cultivation.

Sweet clover will be better appreciated in the future as soon as the people become better acquainted with it. There are thousands of acres of worn out land full of gullies in Tennessee and other Southern States where sweet clover could be grown as a profitable pasture and hay crop as well as improving the soil.

GROWING WINTER RATIONS ON THE FARM.

By H. P. OGDEN, '13.

Much of the profit in the production of meat or milk products depends on the rations fed. In selecting a ration, many factors must be carefully studied among which would be cost, digestibility, palatibility and the amounts and proportions of digestible nutrients. In addition to the above, the farmer must decide what crops to grow to fulfill the requirements and what feeds, if any to buy.

This question of how much to raise depends upon the size of farm, value of land, its fertility, nearness to market and type of animals fed.

Within five miles of the larger cities where farms must be small because of the high price of land, dairying is probably the most profitable live stock farming. Here the aim should be to grow all the roughage emphasizing especially those crops producing the greatest amounts of digestible nutrients per acre. Intensive methods must be practiced using the double cropping system, keeping crops growing on all the land all of the time. In the summer grow corn or sorghum and peas for silage in the winter, oats or oats and vetch or oats and Canada peas for hay. Where it is possible a portion of the corn crop may be allowed to mature for grain and the dry stover cut and mixed with sorghum and peas for silage. This plan requires running water while the silo is being filled to wet it thoroughly. Where this is impractical barley may be grown as a winter crop as it will produce more grain feed per acre than the other cereals on fertile land and will also make good bedding. These crops will produce silage, hay, grain and bedding more economically than the grasses or than corn cut or topped in the old fashioned way.

A ration composed of these crops alone would be too "wide" that is, too starchy—producing fat and energy—and poor in protein and ash, materials producing muscle, bone and milk, which are so necessary in growing animals or those giving milk. Cotton seed meal is rich in protein and ash and at present prices, furnishes these elements cheaper than they can be produced upon the high priced lands near cities.

In short, dairymen near large cities should grow their roughage and starchy feeds as corn or sorghum and peas for silage, oats with some legume in the winter for hay and barley for grain and purchase his protein and ash in cotton seed meal.

Farmers five to ten miles from the larger cities or closer to small towns or near railway stations within forty to fifty miles of the larger cities can afford larger farms and his aim should be to produce all his feed on his farm. He will not be limited to dairy breeds but may grow fat cattle, sheep, swine, etc., yet even here greater profits may usually be realized from dairying or dairying and hog raising combined, though less labor will be required in other types of farming.

His general cropping system will resemble that of the former though it must be modified to include crops

furnishing protein and ash. Plants known as legumes are rich in these substances and include the clovers, alfalfa, peas and beans. Soy beans at $2 per bushel can be profitably fed; yet if markets are convenient, it is more economical to sell the beans and buy cotton seed meal, since there is a greater feeding value in $2 worth of cotton seed meal than in one bushel of beans.

Rations for steers to be fattened have the same requirements as for dairy cows and the aim should be to produce all the ration on the farm.

At greater distances from markets land is still cheaper, more grass may be grown for hay and the type of animals kept will differ in that dairy cattle will not be kept though all other breeds may. While grass hay may be produced cheaper, its feeding value per acre is very much less than those crops mentioned above.

At present the most important feed crops of Tennessee are corn, sorghum and peas, oats combined with a winter legume for hay, barley for grain and soy beans or alfalfa for protein. Clover would be classed among the important crops except for the difficulty met with in growing it. These crops with minor additions and variations necessary to maintain the fertility of the soil must be considered as forming the back-bone of the rations for our State.

In Bulletin No. 80 of this station are several rotations containing these crops.

THOROUGH CULTIVATION.

C. M. HAENSELER, '14.

Soil preparation of some sort is essential to the proper development of plants. Nature herself realizes this fact and therefore uses various means of cultivating the soil for her host of plants. What are the alternate freezings and thawings in winter but natures tools for plowing? Every farmer has noticed that even the hardest road beds are broken up by these powerful forces. And nature does not cultivate only the surface few inches, as do so many farmers, but even subsoils to a great depth by means of her subsoilers, worms and plant roots. Earthworms bury in all directions in the soil, carrying some of the subsoil towards the surface and some of the surface soil downwards. Plant roots often penetrate the subsoil many feet, thus opening and loosening it, enabling other roots to find their way down more easily.

If nature does all of this soil preparation, why should we spend so much time and labor in cultivating the soil? Why not let the freezes, worms and roots do all our work. If we are satisfied with the yields that nature is satisfied with, very well; but, we have reached a time when we desire larger crops, and, in fact are not satisfied unless extreme yields are obtained. If we are to realize these yields we must give the soil thorough cultivation. and the more we expect from the soil the more thorough the cultivation must be.

There are several ways in which thorough cultivation aids plant growth. The first and probably the most important is that it controls the water content of the soil. The value of this is known by all who have had a crop to suffer during a summer drouth. Often the rain comes one week too late and the crop is a failure, whereas, if the soil moisture had been properly preserved by thorough cultivation, the crop could have withstood the drouth and a good yield would have resulted. However, thorough cultivation alone is not sufficient to control the soil moisture; it must be thorough cultivation at the proper time.

Deep plowing in the fall or very early spring followed by discing in early spring and by harrowing as soon as possible after each rain until planting, is a very good plan for preserving water for the summer drouth. After planting, if a cultivated crop, great care should be taken not to allow a crust to form after rains.

Another way in which thorough cultivation aids plant growth is by admitting a large amount of air into the soil. This soil air aids plants in various ways. First, roots require air for the same reason that we do; that is, to breathe. Air also increases the available plant food by the action of the oxygen of the air upon other substances in the soil. Lastly, air destroys a great many of the unfavorable soil bacteria and increases the growth of favorable ones. This is by no means of little importance since the life of a soil largely depends upon the presence of soil bacteria.

Thorough cultivation also greatly improves the texture of the soil, making a fine bed into one which plant roots can easily penetrate in search of food. This fine bed is of especially great value to the young seedling. If the soil is rough and no rain comes soon after seeding probably one third or more of the seed will germinate and die before their roots can get a foothold. This is particularly true with small seed that must be planted shallow.

Weed destruction is the principle object of cultivation with many farmers, and often it is neglected when no weeds are present. The surface should be stirred after each rain if there are weeds or not. This practice will also prevent weeds from getting a start, since it destroys most of them while they are germinating. Thorough preparation of the seed bed is particularly effective in weed destruction. At this time the entire field can be cultivated with harrow or weeder at little expense, so the operation may be repeated more frequently than could profitably be done after planting.

The profit of thorough cultivation is not limited to the increase in yield of the immediate crop. It has a more farreaching effect. It destroys weeds to such an extent that after several years the land may be practically free from weeds, which means greater ease of cultivation and much labor saved. Soil that has been well handled one year is also much easier to cultivate the following year, so that thorough cultivation decreases the cost of a similar cultivation the next year.

Since thorough cultivation controls the water supply of the soil,

increases the amount of available plant food, improves the texture of the soil, destroys weeds, and decreases the amount of labor necessary to prepare the soil the following year, it is essential to profitable crop production, and therefore should be practiced by every farmer.

SOIL INOCULATION, AND THE GROWING OF LEGUMINOUS PLANTS.

J. N. GILMORE, '15.

The average farmer of the South is beginning to realize that leguminous crops are necessary for keeping up the fertility of his lands. He has found from bitter experience that he cannot grow cotton, corn or tobacco forever on his soils. If he is wise, he should not make as great a blunder as some of our farmers do. But if he does happen to make it, there is a way to restore plant-food in a soil. In fact, there are several ways, viz.: by the growing of legumes, the application of commercial fertilizers; the turning under of green crops; and by the use of barnyard manure.

Of the different methods of soil improvement, we wish to emphasize the growing of legumes. Legumes are a family of plants which have an important characteristic of being able to draw nitrogen from the air, and of storing it in the roots of the plant. A few of these legumes are, —all kinds of peas, beans, alfalfa, vetch, clover, peanuts and soy beans. Before they can improve the soil, there must be present in the ground, many little plants or bacteria. Each legume has its own special bacteria. Now, there are several ways of getting bacteria into the soil.

The most common ways are— by scattering previously inoculated soil on the prospective field, by soaking heavily inoculated soil in water and then wetting the seed in this liquid, also, by using the Pure Cultures containing the needed variety of bacteria, which may be obtained from the Department of Agriculture.

Yet any of these methods would doubtless prove a failure if the field contained stagnant water, or if no legume were sown immediately. Even if there were no hindrances such as these, there still might not be very many bacteria present in the nodules the first season, but what few nodules were present, would stay in the soil and multiplication of these would take place, and in another year, or so, sufficient bacteria would be present by this method of soil inoculation for the growing of legumes. Thus it is within the reach of every thinking farmer of these worn out farms, to restore them in a few years to their former state of productiveness.

THE U. T. FARMER

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EDITORIAL.

"Test and try before you buy" is a very true adage when applied to seeds. The loss due to poor seeds and poor stands is much greater than generally realized. Money spent, time lost and work wasted are the results of poor seed and might be largely avoided by simply testing the seed before buying or planting. Do not rely on general appearances—as to form, color or odor—but actually test the germination. This is not a difficult matter. Select at random a certain number of seed and scatter over a moistened piece of heavy blotting paper cut to fit a plate or shallow pan then cover with more heavy blotting paper. Keep moist in a warm place and covered with a piece of glass with crevices to admit air. Count and remove seeds as they sprout and compute from this the per cent that germinate.

The varieties of corn best adapted to Tennessee conditions may be put into two groups, of which one group would include those varieties suited to the poor upland conditions throughout the State. The second group includes those varieties suited to the richer soils or the lowlands. The latter group is the largest and includes some of the varieties found in group one.

Of the poor upland varieties Hickory King stands first and as early maturing varieties Silvermine, a white dent variety, and Leaming, a yellow dent, are both highly recommended. These varieties on the poor soils should be planted at the rate of about 6,000 stalks per acre.

Huffman and Webb's Watson are the best varieties for rich land, both being white with white cobs. Reid's Yellow Dent is a good variety in the rich basin lands and has the advantage of maturing early. The Tennessee Red Cob variety of white corn is very good but it has not been standardized. The varieties mentioned for poor upland have also made good yields on the richer soils where planted from 10,000 to 10,500 stalks per acre. The lowland varieties are planted at the rate of 8,000

stalks per acre. Albermarle Prolific and Cook's Prolific have become rated as the best Tennessee varieties for ensilage purposes.

It is a source of much gratification to us and we feel sure that every farmer of Tennessee will be interested in knowing of the recent Short Course.

Never in the history of the Short Course work at the University of Tennessee has there been such a class. In numbers, State representation, preparation and interest, this class easily excels all former classes. These men, who attended, did not come here offering excuses because they had chosen the farm as a place to spend their valuable lives. On the other hand, the possibilities and opportunities of farm life appealed to every man, and each and every one came with the sole purpose of securing knowledge which would assist him in grasping every opportunity for the betterment of his conditions.

The course has not only been open to both old and young men, but many women have attended. Moreover it is hoped that the women of the State at large will attend in greater numbers hereafter. As a matter of fact, it is well for the women who intend spending their lives on the farm where they have a great hand in the development of the country by doing work in the rural home, rural school and rural church to take advantage of the winter agricultural schools in order that they may increase their abilities for the betterment of the rural conditions.

Some have said that hundreds of the older men of the State would have attended the course; but, for fear of humiliation on account of being men past the "school age" or having gray heads, they would not come. There is no reason why the older men of our State should be humiliated because of their white heads. Many such men have taken advantage of the course this winter and they have expressed themselves as being treated most cordially. Next year we shall be glad to have hundreds of the older men as well as the young to come and take advantage of this splendid opportunity and partake of the stream of agricultural knowledge with us.

It is well to begin fighting weeds long before planting time. The weed is much more easily killed when young because it has not rooted deeply. As a matter of fact weeds should be eradicated because they consume moisture and plant food, shade crops, retard plant life and make the land more difficult to work.

The average yield of corn for Tennessee in 1910 was 22 bushels per acre. This low yield secured on the average must have been due to several causes among which are poor soil, improperly prepared seed beds, poor seed, irregular planting, too few seed per acre, poor cultivation, worms, diseases and unfavorable weather conditions. Many of these conditions are controllable and all of them may be influenced by proper methods of culture.

FACTORS INFLUENCING EFFICIENCY OF FERTILIZERS.

By AGRONOMIC EDITOR.

A fertilizer is any substance, which by its addition to the soil is intended to supply plant food. Various soil stimulants as common salt, and land plaster have been widely used but their beneficial action is indirect only, as they supply no plant food, while their continued use tends toward land ruin.

Soil fertility and crop production are often looked upon as being similar terms, but they are radically different. Soil fertility is an inherent quality of the soil and measures the greatest possible production of which the soil is capable, when other conditions are ideal. These conditions greatly influence crop production and some of them will be briefly noted in this article.

The soil may be looked upon as being a great storehouse from which the elements of fertility, applied or naturally found there, are drawn to supply the needs of the growing plants. Normal development demands from this source sufficient supplies of water, phosphorus, nitrogen, potassium, calcium, sulphur, iron and magnesium.

Fertilizers may often prove profitless through no lack of plant food, but because the product which it is used to grow is unprofitable. This is sometimes the case with the corn we are growing as well as with our various other crops. A good strain of any living thing, whether it be in the animal or vegetable kingdom, requires for the showing of its good traits conditions superior to those required by the unimproved types. It is necessary, therefore, if we are to apply fertilizers profitably that we use superior seed so that we may be recompensed for the expenditure we have made.

A cultivated species of plant requires a home with cultural treatment. This has been brought about through generations of artificial selection and care in which some of the hardier characteristics common to the original plant in its wild state, have been lost and as a result they are rather dependent upon the farmer for the selection and preparation of a home. This home will largely influence the profitableness of our application of plant food. The soil should be broken to a good depth so the roots can spread freely in search of food material, as well as to allow the sanitary conditions of the root system to be maintained by the circulation of oxygen throughout the soil. The harmful gases released on decomposition of organic matter are thus disposed of and the excreta of the plant itself is oxidized and purified and bacterial development is furthered.

Sufficient moisture is necessary to the profitable production of any crop. Without it no plant food would ever be in solution and plant feeding would be impossible. We should, then, as far as is possible, see that we use reasonable means to maintain a sufficient supply of moisture in the soil. Humus plays an important role in this connection.

As the humus content of the soil decreases, the productive capacity of the soil likewise diminishes. It becomes less retentive of moisture and inferior in physical quality. An increase in humus gives an increase

in the mineral plant foods made available, viz., phosphoric acid, lime and potash. More humus makes the need of artificial fertilizers less and their application more profitable. Rotations should be practiced, which allow a humus forming crop to be followed by a humus consuming one. Soils with a general distribution of humus acting upon the mineral constituents of the soil release the above mentioned plant food, together with nitrates which are readily soluble and are liable to leach away if a catch crop is not provided.

The temperature of a place also has an influence upon the profitable use of a fertilizer upon a particular crop. Species of plants not adapted to a climate may not be highly productive regardless of heavy applications of fertilizers. However, this is not a source of loss of great importance; moreover, the market value of a crop grown outside of its climatic adaptability may offset the poor productiveness and rank it a profitable one.

Insufficient light impairs the normal development of any plant for without light, plant growth is impossible. A meager supply of light is followed by a meager return with our general farm crops. The need of this factor in crop production is clearly seen where plants are closely crowded together. Each does its best to overtop the neighboring ones, and some win in the struggle, while others are overshaded and lead a sickly life or are killed outright.

After the seed has been planted and has germinated and other conditions are favorable, growth begins and with it a demand for plant food is made. The needs of the particular crop that is grown should be ascertained as for as is possible. The ability of the fertilizer applied to supplement the deficiencies of the soil should also be known, because to try to produce a crop on insufficient food is poor economy and to supply elements already present in abundance is a waste. Some crops need immediately available food, while others do better with a supply gradually becoming available.

As has been before mentioned, humus or green manure has great power in releasing the mineral elements of the soil as well as being a good soil conditioner. The water-holding capacity permits the solubility of plant foods and their passage through the soil water into the plant and through the channels to the leaves where it is transformed into cell building material. In case of sour soils, lime is supplied to correct this condition and thus prevents the inhibition of bacterial development, which is so essential to profitable agriculture. Less than 5% of a mature crop comes from elements which have a money value as plant food, but be this as it may, crop production is impossible without a supply of these necessary fertilizing elements.

Lastly, crop production will be unprofitable unless due regard is given to cultivation. The weeds on our farms are hardier than our cultivated plants because of the natural selection to which they are subject. Only the ones produce offspring which are able to survive in the unaided struggle for existence, while with our cultivated species this is

not the case. Cultivation, therefore, to bring about conditions favorable to the liberation of plant food and its transference to the plant and to make a congenial home for the plant roots, is evidently good practice.

HOG PASTURE.

JEHU L. HINSHAW, '13.

There are several things to be kept in mind in pork production. Probably, the most important is a good ration. The more of this ration that can be furnished by pastures, the better. The climate of Tennessee is such that pastures can be had almost the entire year.

Why Pastures Are Needed.

When corn sold at 25c per bushel; pork could be produced at 3 to 5c per pound on corn alone. It did not pay to furnish pastures and other supplemental feeds for corn was the cheapest feed to be had. With corn at 70c per bushel, 7c per pound is the cheapest that pork can be produced on corn alone while 8 to 9c is the average. It takes on an average of 500 pounds of corn to produce 100 pounds of pork. The following reports of the different Experimental Stations will show the value of pasture in connection with grain.

Alabama Station carried on experiments with two lots of pigs of 3 each averaging 50 pounds. One lot was fed corn alone, the other had a range of cow pea pasture in connection with the corn.

	Average Daily Gain, lbs.	Corn for 100 lbs. Gain
I lot corn alone in dry lot.....	0.4	.586
II lot cow pea pasture and corn	1.0	.307

The area grazed by the pigs equalled one-sixth of an acre and the yield of peas was estimated at 13.2 bushels per acre.

It will be seen that the pigs on the pasture gained nearly 3 times as fast as the others. The following results as to the value of soy bean pasture is given by the same Station.

	Average Daily Gain lbs.	Feed for 100 lbs. Gain	
		Corn, lbs.	Pasture, acres
I lot corn 3.7 lbs	0.8	456	
II lot corn 1.6 lbs. soy beans .	1.0	157	.28

The pigs on the soy bean pasture made 25 per cent better gains than those fed corn alone and required only 157 pounds of corn.

At the Wisconsin Station in 60 day trials for two years two lots of pigs averaging 104 pounds were used, one lot grazed on rape pasture and the other in field of second growth clover. There were fed a mixture of 2 parts corn and one part shorts, with the results given below.

	Daily Concentrates fed.	Average Daily Gain	Concentrates per 100 lbs. gain
I lot on rape pasture	3.7	1.1	362
II lot on clover pasture ..	3.7	1.0	390

The pigs on the rape pasture made somewhat larger dairy gains and required less corn per 100 pounds gain than those on clover.

From numerous trials at the same Station, it is concluded that with pigs from 4 to 10 months old, an acre of good rape has a feeding value of 2,436 pounds of corn meal and wheat shorts when grazed in connection with those feeds. The above facts show the value of pasture for hogs.

Crops Suitable For Pasture.

Let us now consider the kind of a rotation to practice to obtain a good pasture all the time. Rape sown in February and March will be ready in 6 to 10 weeks for good spring pasture. If sown from July to middle of September, it produces good pasture until frost. Soy beans and corn and cow peas make ideal pastures; for hogs finished on soy beans or cow peas alone make soft pork but with the corn the meat will be firm.

Sorghum is also used for summer pasture. When used with cow peas it gives good results. Care should be taken not to allow the stock to eat the second growth as bad effects may result.

Peanuts are also a very fine pasture crop.

Alabama Station (Bulletin 143) shows one lot of pigs fed 3.8 pounds corn alone made a daily gain of 0.7 pounds, while a lot fed 1.6 pounds corn and allowed to forage in peanut field gained 0.9 pounds daily. It was found that one acre of peanuts was equal to about 3,200 pounds of corn in feeding value. When a legume crop like peanuts is pastured by pigs, the increased fertility, as shown by the succeeding crop, will more than pay for growing the legume.

Arkansas Station (Bulletin 54) showed that one acre of peanuts gave 1,252 pounds gain, one acre of chufas gave 592 pounds gain, one acre of corn gave 436 pounds gain.

The pork from the corn and chufas was firm, while that from the peanuts was oily and soft. Pigs fed peanuts should be given some corn.

For winter and spring grazing a mixture of crimson clover, wheat, oats, rye or barley will give good results. Canada field peas sown in February with oats will furnish good grazing.

Cost of Pasture.

In seeding an acre of rape, from 4 to 6 pounds are used at a cost of 10c a pound, making the seed cost from 40c to 60c per acre. The cost of cultivation and seeding will be about $5.00, about $2.50 cost for fencing making a cost of about $7.50 per acre for the rape pasture. Cow peas cost about $2.00 a bushel. If they are drilled in rows about 2 feet apart, it will require one-half a bushel per acre; if sown broadcast, about one and one-half bushels.

If drilled in rows, the cultivation will cost about $5.00, the seed $1.00, and the fencing $2.50, making a cost of $8.50 per acre. The cost of soy bean pasture will be about as much as the cow peas. Peanuts cost about $2.50 per bushel and it will take about 2 bushels per acre, making a cost from $10.00 to $12.00 per acre. There is no cost of harvesting as the hogs do this. All the manure is returned to the soil where it is most needed.

The Mississippi Station shows that when a crop like soy beans or cow peas were hoged off the fertility of the soil was increased enough to pay

for seeding and cultivation of the crop.

We see that we not only get the pork as a finished product from our pasture but at the same time the fertility of the soil is at least as good as before the crop, perhaps, much better.

With the climate of Tennessee where we can have pastures almost the entire year, that will cut down the cost of producing the pork and at the same time build our soils, why should we not grasp the opportunity?

WHY NOT TO PLANT TOO EARLY.

By H. A. POWERS, '13.

When winter begins to break, and several warm days give all about him the appearance of spring, almost every farmer feels that he can wait no longer to commence his new year's work. He has already forgotten how the season before he planted his corn too early, and then failed to secure a stand. He does not remember how vigorous and healthy the second planting was; how much less work it required than the first planting.

It seems as though all is ready to plant a field of corn. He plows the soil rather shallow in order to get it prepared for the planter before the rain comes. He has hardly finished the planting until it begins to wet the ground. By the next morning a heavy shower has fallen and the air is very much cooler. The seed bed is already full of water which soon becomes quite cold. This retards germination and the seed either scur, or only a few of them appear above the earth as weak plants. Several days of cool, damp, cloudy weather kill or decrease their vigor until only a few remain. Perhaps there may be enough to cultivate the first time, but the farmer is very sure to plow it up after the first tillage and replant it. If it is allowed to live cold weather is certain to bring the cut worms which will kill more of the plants.

Before planting a crop, every one should remember that there are certain conditions under which seeds will grow into healthy, vigorous plants. Some seed require a very warm soil in which to germinate while others will thrive in a much cooler place. Every one who has grown corn and cotton knows the former will thrive in a cooler climate than the latter. No two seeds are exactly alike in their temperature and moisture requirements for growth. As many of the differences as possible should be found out, and then no one should attempt to produce a plant under unnatural conditions, yet this is what is done when corn is planted in March.

Hasty preparation almost always means a poor seed bed which has many disadvantages for the growing plant. If the soil is broken shallow, the water runs off and carries with it the most fertile part of the soil, instead of being absorbed and stored away for the use of the plants after the rains become less frequent. A lack of water is generally the limit-

ing factor in the production of crops, hence we see the necessity of saving every bit of rain fall possible.

Not only fertile soil is lost, but the channels of streams already too full of such material are made fuller which increases destruction by overflows.

Instead of plowing the soil too early a better practice would be to grow some cover crop to protect it from the heavy spring rains and thus save much fertility.

After a plant has struggled through cold, damp weather it is very likely to be stunted. When the weather becomes favorable for its growth, it is slow and the plant lacks vigor. A longer growing period requires more cultivation and thus the cost of production is increased. The cost of replanting must also be added to this, when it is necessary to plant again.

A poor stand and weak plants tend to decrease the yield and at the same time increase the cost of production. Thus we see that planting too early results in poor seed bed, weak germination, stunted plants, decrease in yield and soil fertility, and increase in the cost of production.

EFFECT OF SELECTION IN BREEDING.

By A. S. ADSMOND, '12.

Selection is one of the most important factors in plant and animal breeding, with the natural capacity of all life to vary furnishing the basis on which the breeder has to work. Variations are due in some cases to environment but this only modifies the individuals of one generation and thus no permanent effect is produced. Abnormal variations are also produced in both plants and animals but are not considered hereditary by latest investigators. On this Prof. H. S. Jennings says: "In the examination of a large number of unicellular animals, paramecia show that these nontypical characters are never reproduced in the young." Jennings also found that selection within a pure race is of no effect on size. This statement has been corroborated by Dr. Raymond Pearl and Mr. Frank M. Surface of Maine Agriculture Experiment Station in saying that "There is a rapidly accumulating mass of evidence that the chief, if not the entire function of selection in breeding is to isolate pure strains from a mixed population, and that it is found in actual experiment impossible to bring about by selection improvements beyond the point already existing in the pure strain at the beginning." Thus the conclusion may be drawn, that systematic and continued selection is without effect in a pure race, and in a mixture of races its result consists in isolating the existing races, not in producing any new ones.

It is said by Pearson that race progress is due to selection in some form or other, and to no other cause that we know. Alexander G. Bell states: "That the superior individuals have the larger proportion of super-

ior offspring as compared with the average of the race, and where both parents are superior this proportion would be increased. Then where three or four generations are superior the offspring is considered a thorobred. This has likewise been proven true with all domestic animals as well.

This fact is very clearly shown since testing machines have come into use so there is a means by which to get at the actual merits of an individual. After a dairyman finds out the records of his individual cows, he can then select his best cows to produce the heifers to take the place of the unprofitable ones. Then by the selection of a sire from good parents he will gradually be able to build up his herd without buying altogether new stock to start with.

The advanced register of the Jersey and Holstein cattle have made great progress by the selection and breeding of those cows and sires making the higher records. Of the 168 cows in the Holstein Advance Registering Association making 100% above the requirements, 73% of them are from parents who are both in the A. R. A., while only 3% have neither sire nor dam in the A. R. A.

Of the Bulls having 9 or more daughters in the A. R. A., 58% of them have both sire and dam in the A. R. A., while 12% have neither parent in the A. R. A. of the 5 bulls in the Holstein A. R. A. having 75 or more daughters in the A. R. A., 100% of them are from sire and dam in the A. R. A.

The selection experiments carried on with animals are very rare on account of the few produced to select from by each individual as compared with the plants. There are a number of experiments on record of the effect of selection upon plant breeding. The fiber of Achmauni Egyptian cotton has been increased about one-fourth of an inch in four year's time by a systematic selection of the plants which produce this strain of lint. This has been done without any falling off in the yield. Another very interesting experiment is that with the Sea Island cotton. It has been selected very carefully for many years with the idea of lengthening the lint and bettering the quality, and also decreasing the proportion of seed to lint. The lint has been developed to a silky-like fiber with an increased length of from one-half inch to three-fourths inch, but are only maintained by careful selection each year, for as soon as the selection is neglected it begins fast to decline. The finest grades are now used to adulterate silk. The price for this fine grade of cotton is from 50 to 60 cents per pound, while the price for ordinary cotton is from 15 to 30 cents. On one bale of cotton this would mean an increase of about $100.00 in favor of the selected variety, and this would surely pay for the extra work in producing the latter.

A selection test run at the Ohio Experiment Station from 1903 to 1906, with potatoes, showed some interesting results. A hundred hills were first selected in an ordinary field. Out of these 100 hills were planted—selecting the best hills for seed. Also 100 hills of low yielding were treated the same—by selecting 100 of the poorest yielding hills each time. The high yielding potatoes

yielded about one-third more each time than the low yielding. A selection for blight resistant varieties was carried on at the same time, and a great difference along this line was also noticed.

The red clover resistant strain for the anthraenose disease which was worked out at the station farm by Professor's Bain and Essary has been worth millions of dollars to the State. This was accomplished by going into the diseased fields and finding a few plants that seemed to have some resistance for the disease. Then selections were made from the progeny of these plants till an absolute resistant variety was established. It is estimated that this resistant variety has a value of 50 to 1 against the non-resistant variety.

There have been many trials at selecting a hardy variety of orange which would stand the frost farther North, but very little has been done and selection seems to be unable to produce this feature, while by hybridization, varieties have been produced that will thrive 400 miles north of the minimum temperature line of the ordinary citrus plants, or they will grow in regions with a minimum temperature of 15° F. On the other hand selection has done wonders in improving quality of fruit and decreasing the number of seeds.

Wheat breeding at the Minnesota Experiment Station was carried on very extensively for many years, and only two varieties were produced of any marked improvement. It is estimated that these varieties have already made enough profit over the old varieties used to pay for all that prolonged selection cost, regardless of what it will mean in the future.

The Minnesota Station has also done some extensive selection in flax production. It has increased the fiber 6 inches in length over the original variety, this means an increase of 20% of fiber, which is of no small value.

Another great result produced by selection is the increased sugar content of the sugar beet. At the expense of hundreds of thousands of dollars, European seed growers have increased the sugar content of the sugar beet 100% in the last century, and this in turn has brought millions of dollars added wealth to the world.

About one of the most extensive breeding experiments by selection is that done with corn, which has been done chiefly by the farmers of America. They have, by selecting the best ears in their fields of thousands of ears, increased the yield about 20%. The farmers of Canada and the far North have by selection gotten varieties that will mature early enough for their short seasons. This has also been worth untold millions. Dr. Hopkins has showed by selection that the protein and oil content of corn can be increased from 6 and 8% to 12 and 14%. This will increase the value of corn considerably on account of the high prices of the contents which go to make up protein chiefly.

The effect of selection upon tobacco in Connecticut has increased the yield in pounds per acre from 1,000 pounds to 1,520 pounds, and the quality of desirable wrappers has been increased from 45 to 70%.

There are numerous other cases

where the breeding of plants by selection have produced great gains, and there is no doubt but that it will do vastly more in the future in the way of selection for resistant varieties to diseases.

SOIL MOISTURE.

By P. P. HITE, '13.

The State of Tennessee has an average rainfall of nearly fifty inches which alone, if conserved in the soil for the growing plant, would produce between 125 and 150 bushels of corn. The soil ought to be used as a storage reservoir for water. And if the farmer succeeds in bringing a large portion of the rainfall in the soil and keeps it there until the plant needs it, a good crop is assured him. The best way to save this moisture is to plough deep and give the soil thorough cultivation and the farmer who does this will receive more net profit from his farming operations in a series of years than one who follows old methods.

Water is found in the upper layers of the soil in three conditions:

1. That which is absorbed by the soil particles from the water vapor of the air called hygroscopic water.
2. That which is held by surface tension, as a more or less thickened film around the soil grains and in the small pore spaces between them called capillary water.
3. That which is being drawn downward through the soil by gravity—called Gravitational water.

The hygroscopic water is of no value in furnishing water to the growing plants and the gravitational is directly injurious to the upland crops, but when it exists at a depth of from four to six feet below the surface it may serve as a reservoir from which moisture is drawn by capillarity to offset losses by evaporation.

Capillary water or that which is held against gravity, in the small pore spaces, is the source of supply of the growing vegetation.

This water is free to move in any direction in the soil. Capillary force can draw the water slowly through the soil to other portions that may have become dry. Such water always moves from the wetter towards the dryer soil. If evaporation is checked at the surface, the upward movement of water stops as soon as the soil particles near the surface have as much water as the neighboring particles. If there is no addition or loss of water for some time, its movement stops. Disturb the equilibrium by addition or loss of water and movement starts again.

The Nebraska Experiment Station showed that the plant draws water by capillarity from a depth of ten feet and deep rooted plants as alfalfa drew on the water fifteen feet below the surface.

In order for plants to make their best development, the soil must be in such a physical condition that their roots can readily penetrate it and ramify through it. It must contain sufficient capillary water to supply the needs of the plants and this water must be renewed as it is

taken up. There should be no large air spaces since these cause the soil to dry out too readily and prevent the development of the many fine branching rootlets necessary for the best growth.

The soil should be plowed from 12 to 15 inches deep, so there will be a reservoir to hold the water until the plants need it. Proper tillage has two effects on the soil: First, the soil is brought into a deep mellow, but firm seed bed, which will absorb and store rainfall and prepare plant food; second, the loss of water by evaporation is prevented to a great extent. After the soil reservoir has been well prepared and the rain has filled it with capillary water, tillage should be so directed that evaporation is reduced to the lowest possible point. The water that passes through the plant is of benefit to the crop but that evoporating through the soil is wholly lost. In spite of all that can be done, some water evaporates in dry weather but it may be materially reduced by a loose dust mulch.

Such a loose soil covering the moist reservoir will conserve the soil moisture by diminishing direct evaporation. It is well established by the experience of farmers as well as by direct experiments that a layer of loose dry soil 3 or 4 inches deep is effective in preventing the excessive drying of soils. The soil mulch and the cultivation to produce it causes the plants to root deeply. The aeriation of the soil is improved and in all respects the effects of the dust mulch are good. To be most effective, surface tillage must be kept up. The soil must be cultivated after each rain in order to break the surface crust.

Tennessee has its greatest rainfall in the winter months and if the ground is not plowed in the fall, a greater part of the water will run off. Plowed land will absorb the water much more freely than land not under cultivation, or which is covered with grass or for any reason has a hard surface. This is one good point in favor of deep fall plowing for the next corn crop. If the soil is not plowed deep enough to absorb the largest rainfall, it is better to leave the surface hard. For the big rains will come down the hills and take the loose soil away as deep as it has been plowed. On this account many fields are in a worse condition in the spring than they would be if they had grown a cover crop on them all the winter to prevent this washing.

If a green cover crop is grown in the winter and turned under in the spring for green manure, it should not be allowed to stand until it has exhausted the soil moisture. If left too long, the soil will be cloddy, the plants will not root well, and the soil may be too dry for the subsequent crop to get a good start. The grounds should not be seeded until the cover crop is decomposed. This green crop adds organic matter to the soil which increases the water holding power and improves physical condition. The organic matter is used up by oxidation during tillage and the soil becomes "out of condition" run together, after heavy rains, unless this loss be made good.

INHERITANCES OF DISEASE RESISTANT CHARACTERS.

By C. E. ALLRED. '12.

A great deal has been written about disease resistance among plants and animals, and more especially among plants. There is no longer any question as to the existence of disease resistant varieties as is proven by the development and propogation of resistant strains of clover, tomato, potato, wheat, cow peas, etc. Aegerian sheep are resistant to authrax; and many cattle are resistant to Texas fever tick.

Resistance may prevade the whole species, as in the resistance of sheep to black leg; or in varieties as in iron cow pea resistance to wilt; or in individuals, as the specimen plants found in a field over which the disease has swept. Texas fever is fatal to some cattle, others suffer only mildly, while some have been found on which the ticks would not live at all. It has been estimated that 1% of all hogs are immune to cholera.

As to the exact cause of this resistance, we do not know. For many years it was thought to be morphological in nature, dependent on the thickness of the cell walls, or something of that nature. But now it is known to be in some way due to a physiological cause, since it can be developed and the structures remain the same as before. W. A. Norton, U. S. Department of Agricluture, says it is "a definite constitutional character due to presence in the cells of protective enzymes or complex anti-bodies." Delaware Bulletin No. 91, assigns the cause of resistance to tannin saying, "tannin is not a by-product but is produced for the purpose of protecting plants from diseases and insects." E. M. Greeman writing in phytopathology says that the "essential character of resistance to disease consists in a protoplasmic activity, the resistance lying in the protoplasm of the mesophyl cells," while D. Konridi says that living tissue may at times be immune because of the fact that the osmatic process in it hinders the development of the micro-organism." Bateson says that, "if, as may be suspected, the resistance is due to the presence of some anti-toxin, the dominance of susceptibality must be taken to indicate that the formation of the anti-toxin is prevented by the presence of a factor in the dominant forms, a conclusion which may lead to definite progress in the physiology of disease resistance." Professor Bain considers that resistance is due to a chemical substance, a different chemical being required to cause resistance in each different variety.

Most authorities incline to the view of regarding natural immunity as a constitutional variation which has become dominant in the race by the elimination of those members who were not immune.

So far as I could find, there has only been one experiment performed to determine whether or not resistance is a mendelian character. This was made several years ago by S. H. Biffin of England, using two varieties of wheat, one susceptible to rust and the other resistant. When these two were crossed a hybrid was pro-

duced which was as rusty as the susceptible parent. But these cross breeds produced plants which were rusty and clean in the proportion of 3 to 1. Biffin thus found that susceptibility is a dominant and transferable character, while immunity is a recessive character. It may be surmised that various types of resistance will be found, some dominant, as well as others, like that of wheat, which are recessive. While we are sure that resistance is a unit character, yet resistance to one disease does not imply resistance to another disease.

It has been found that hybrids between resistant and susceptible plants are able to infect the immune parent, and also to produce more severe infection on susceptible plants than was spares from the susceptible parent. This is known as "Bridging," the hybrid having the pathogenic properties of the rust spores distinctly increased. This difficulty is easily overcome by breeding the hybrids to themselves.

Generally speaking, resistant strains retain their resistance for many years. "Sensation" cotton has retained its resistance for 8 years now, Iron cow pea equally as long, while Rivers cotton has been resistant for 15 years and is increasing in resistance every year.

D. Konridi performed some experiments with dogs to see if acquired immunity to rabies is inherited. He found that if the bitch was immunized while pregnant, both the bitch and pups became immune for some time, the pups remaining immune longest. And that if the bitch were immunized before she became pregnant, part of the pups became immune and some not. This latter, however, is an isolated case, it being generally agreed that acquired immunity is not inherited. In another experiment the progeny of immunized hogs showed no reduction of susceptiblity.

Professor Essary says that some individuals of all varieties of tomatoes are resistant to blight. That this character is transmitted to succeeding generations—and that it is possible to breed up a resistant strain of any desirable type. This is probably true for all species. If no resistant strain can be found, however, we can often find re-combinations of the desired strain by hybridization, this being admirably shown in a watermelon wilt experiment. The susceptible watermelon was crossed with the resistant citron. The F. generation was of no value, but when this was again crossed with the watrmelon, the product was a resistant vine, producing edible fruit, and breeding true. So, disease resistance may be associated with other desiable qualities.

The yearly loss from plant diseases in the United States, runs into the millions of dollars. Every cultivated crop has a number of maladies. Some of these can be contralled to some extent by fungicides and disinfectants. But these are only expensive to prepare and apply, but often damage the plant or fruit to which they are applied. The breeding of resistant varieties is the only permanent relief—and enormous possibilities are open to the breeder in that line.

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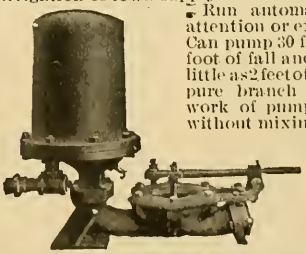

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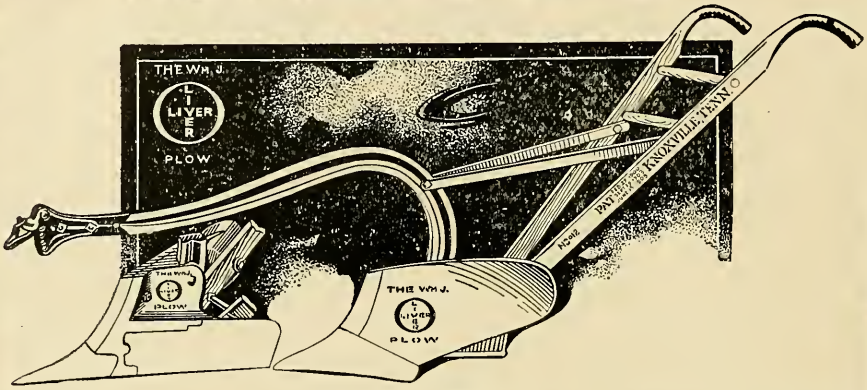

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THE U. T. FARMER

LIVE STOCK NUMBER

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Vol. VI. APRIL, 1912 No. 7

Published Monthly by

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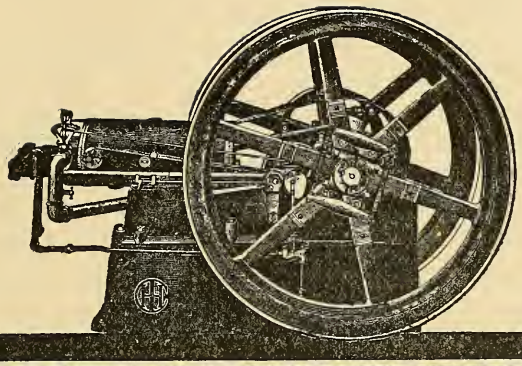

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INGALL'S RAPHSODY ON GRASS.

"Next in importance to the divine profusion of water, light and air, those three great physical facts which render existence possible, may be reckoned the universal beneficence of grass. Exaggerated by tropical heat and vapors to the gigantic cane congested with its saccharine secretion or dwarfed by polar rigors to the fibrous hair of northern solitudes embracing between these extremes the maize with its resolute pennons, the rice plant of southern swamps, the wheat, rye, barley, oats and other cereals, no less than the humble verdure of hillside, pasture and prairie in the temperate zone grass is the most widely distributed of all vegetable beings and is at once a type of our life and the emblem of our mortality. Lying in the sunshine among the buttercups and dandelions of May, scarcely higher in intelligence than the minute tenants of that mimic wilderness, our earliest recollections are of grass; and when the fitful fever is ended, and the foolish wrangle of the market and forum is closed; grass heals over the scar which our descent into the bosom of earth has made, and the carpet of the infant becomes the blanket of the dead.

"Grass is the forgiveness of nature—her constant benediction. Fields trampled with battle, saturated with blood, torn with the ruts of cannon, grow green again with grass and carnage is forgotten. Streets abondoned by traffic become grass grown like rural lanes, and are obliterated. Forests decay, harvests perish, flowers vanish, but grass is immortal. Beleaguered by the sullen hosts of winter, it withdraws into the impregnable fortress of its sub-terranean vitality and emerges into the first solicitation of spring. Sown by the winds, by wandering birds, propagated by the subtle horticulture of the elements which are its ministers and servants, it softens the rude out-line of the world. Its tenacious fibers hold the earth in its place and prevents its soluble components from washing into the wasting sea. It invades the solitudes of deserts, climbs the inaccessible slopes and forbidden pinnacles of mountains, modifies climates and determines the history, characters and destiny of nations. Unobtrusive and patient, it has immortal vigor and aggression. Banished from the thorofare and the fields, it bides its time to return, and when vigilance is relaxed, or the dynasty has perished, it silently resumes the throne from which it was expelled, but which it never abdicates. It bears no brazonry of bloom to charm the senses with fragrance or splendor, but its homely hue is more enchanting than the lily or the rose. It yields no fruit in earth or air, and yet, should its harvest fail for a single year, famine would depopulate the world."

THE U. T. FARMER

Vol. 6. APRIL, 1912. No. 7

THE FEEDING AND CARE OF CHICKENS.

By EARL M. BEST.

On most farms the chickens are not given enough attention. The feeding and care are two of the most important subjects in poultry raising. Almost all the farmers just feed one grain, corn or wheat being the most common. The feeding would not do much good if the fowls were not housed and cared for properly. All three of these things are neglected on lots of our farms. The reason the person in the town gets more eggs than the farmer, is because that person gives more time to his flock.

I will take up the feeding of little chickens first. This item cannot be given too much attention, because if you don't start right you will not end right. These chickens should also be given the best of care if they are to be the breeders when grown.

The following table gives the amount of the various nutrients 100 pounds of chicks will eat per day at 2 weeks and 7 weeks of age:

Age period	Dry matter	Ash	Protein	Carbohydrates	Fat	Nutritive ratio
2 weeks	10.1	.5	2.0	7.2	.4	1:4.1
7 weeks	7.4	.5	1.6	4.9	.4	1:3.7

Below are some rations which will be found to contain these nutrients in proper amounts.

First five days: Eight parts rolled oats, eight parts bread crumbs, two parts beef scrap or boiled eggs, and one part bone meal.

This mixture should be moistened with sour skimmed milk and fed five times a day. They should also have some of the following mixture in a pan:

Three parts wheat, 2 parts corn, (both cracked) and 1 part pinhead oatmeal. Keep grit, charcoal and green food for them all the time.

Five days to four weeks: Three parts wheat, (cracked) two parts corn, (cracked) and 1 part pinhead oatmeal should be scattered in the litter twice a day. Three parts wheat bran, three parts corn meal, three parts wheat middlings, three parts beef scrap, and 1 part bone meal moistened with sour skimmed milk, fed three times a day. Keep the above mixture DRY for the chicks all the time. Also keep grit, charcoal and green food in their reach all the time.

Four to six weeks: Feed this mixture in the litter twice a day. Three parts whole wheat, 2 parts cracked corn, and 1 part oats. Moist mash once a day, but dry mash all the time.

If the chickens are fed as above and cared for in the right way, they are sure to grow fast and be healthy.

Now we will come to the care of

the chicks. This item can't be given too much consideration. Keep hens or brooders free from lice and mites by applying the following solutions:

Lice Powder: 3 parts gasoline, 1 part crude carbolic acid or cresol, and add plaster of paris until dry.

Lice Paint: 3 parts kerosene, and 1 part crude carbolic acid or cresol.

Keep the houses and runs clean, be regular in your feeding, don't let them run in the wet weeds or they will surely die, feed fresh food and not too much at a time, and keep them in a yard until they are big enough to take care of themselves, and be sure to keep fresh water before them all the time.

If you care for them in the above way they will grow fast and be healthy.

Feeding Laying Hens.

Everyone who has poultry wants to get the greatest number of eggs possible, and the feeding and care of the hens has much to do with it. With eggs at 20 cents in the summer and 35 or 40 cents in winter it is worth while to try to get more eggs isn't it? If you feed and care for them right, they will be sure to repay it in more eggs.

Below is a table which gives the amount of the various nutrients 100 pound of hens will consume in a day:

Weight Lbs.	Dry matter	Ash	Protein	Carbohydrates	Fat	Nutritive ratio
3—5	5.50	.30	1.00	3.75	.35	1:4.6
5—8	3.50	.20	.65	2.25	.20	1:4.2

The feed for the hens should contain these constituents and in the amount given in the table.

Below are some properly balanced rations. Grain mixture, to be fed in the litter, twice a day, morning and afternoon:

Wheat	60 lbs.
Corn	60 lbs.
Oats	30 lbs.
Buckwheat	30 lbs.
or, by measure	
Wheat	32 qts.
Corn	36 qts.
Oats	30 qts.
Buckwheat	20 qts.

The buckwheat is to be omitted during the summer. Mash mixture, to be fed dry in hoppers open in the afternoon only.

Corn meal	60 lbs.
Wheat middlings	60 lbs.
Wheat bran	30 lbs.
Alfalfa meal	10 lbs.
Oil meal	10 lbs.
Beef scrap	50 lbs.
Salt	1 lb.
or, by measure	
Corn meal	57 qts.
Wheat middlings	71 qts.
Wheat bran	57 qts.
Alfalfa meal	20 qts.
Oil meal	8 qts.
Beef scrap	43 qts.
Salt	½ qt.

The fowls should eat about half as much mash as whole grain, by weight. Cabbage, beets, sprouted oats, green clover or some other green or vegetable should be given two or three times a week. Grit, oyster shell and charcoal should be available all the time. Fresh water must be before the fowls all the time to insure health and eggs. Do not feed green food in a frozen condition. Keep fresh litter all the time, as damp or musty litter carries disease germs.

The caring for the hens is the most important part of the work. If you feed them properly, but do not care for them properly you are losing money.

Have a warm house for them, but not air tight by any means, as air tight houses get damp and cause disease. The best kind of a house

is the open front style. This house has plenty fresh air, yet it is warm enough. Do not let the hens roost in trees. Be regular in your feeding, do not rock the hens when they get in the garden, keep the house clean and comfortable and talk to your hens and they will repay the trouble many times, with more eggs.

If you care for them in this way you are sure to get eggs.

PRODUCING THE SPRING LAMB.

By P. P. HITE, '13.

When warm spring days come, there arises on the Eastern market a great demand for the spring lamb, as this demand seems to be associated with the temperature, the opening of the lamb market depends somewhat upon the season. The price varies considerable from one season to another, because the American people have not yet developed the standardized taste for mutton as they have for other meats; consequently the visible supply gives but little indication as to the price that will prevail when the market opens. In the season of 1907, lambs sold for phenomenal prices. And the following season the supply of lambs was about the same but the people were calling for other meat and consequently the market dropped 3 or 4 cents lower than it was in 1907.

Owing to certain climatic conditions which are not suited for destruction of many parasitic larva, the shepherd must be continuously fighting them. This is one reason why lamb production will always be in favor. In the South, lambs can be grown in the early spring season and be put on the market in late May and early June before bad weather, when heavy infection takes place.

To produce these lambs, select strong healthy ewes with good udders and mouths. The mouth is good as long as the teeth are not too short and not separated. Since the animals live off of grazing crops, it is essential that the teeth are good. If the ewes have produced a lamb, examine the ewes to see if they have been troubled with garget. If such be the case the ewes will prove to be very unprofitable mothers and will not be able to raise two lambs if they produced them.

If the lambs are to be marketed in May or June, they should be dropped in January. To do this the ewes must be bred by the middle of August, since the gestation period is 147 days. To get the best lambs, use three yearling rams of one of the mutton breeds, to 100 ewes and if ram lambs are used the number should be doubled. Do not breed the ewe when fat. Keep her in a gaining condition until lambing time. If she is a good mother and heavy milker she will lose flesh rapidly while she is suckling the lamb, therefore she should store up her flesh in the fall.

Many of the Southern fields are infested with parasites and the shepherd should keep particular watch to see that they do not get too strong a hold on ewe and weaken

her materially. Where three or four pastures are available the flocks should be changed about every three or four weeks to keep down the infection as far as possible.

The lambing season is the most trying time on the shepherd and he must be willing to go through the flocks several times during the coldest nights to see if he can aid a newly born lamb. If there are twins the ewe will go off with one and leave the other one to chill to death. If the shepherd should find a young lamb, he should see that it gets its first meal and when the lamb gets full of milk before it gets chilled through he should consider it half raised.

As the lambs are to be nourished without grass some green crops should be provided for, during January, February, March and April. Crimson clover or vetch sown with rye, oats, wheat, barley are splendid for pasture. Two or three days after the ewe has lambed, give her the run of this pasture. It is better to withhold her a couple of days after lambing on account of the increased flow of milk for much injury may be done to both the ewe and lamb by an over supply of milk at this period. If the ewe produces strong twin lambs and is not a heavy milker, it will be well to put her on green pasture at once. To select ewes that are good mothers and are prolific is one of the secrets of success in spring lamb production. The ewe and lamb should be kept on green pasture until the latter have gone to market. A January lamb should weigh 65 to 80 pounds by the first of June if well cared for.

It is very easy to over stock a farm with sheep and should such be the case, silage may be fed to the ewes with great advantage. A little cottonseed meal may be fed with the silage. In the case of over stocking, silage should be fed and lambs have access to green pasture as the combination is found most profitable. Lambs may be fed a grain ration of bran, cottonseed meal and corn even when the pasture is good.

Tennessee lambs should go to market a couple of weeks before the Kentucky and Virginia crop. After the lambs from these States come on the market the demand for Tennessee lambs decrease considerable on account of the superior quality of the former.

For the last three or four years the earliest lambs have been selling for 6 and 7 cents per pound and July crop at 5 cents a pound. Thus we should get the lambs to market as early as possible for the later ones never feed or grow out as well as the earlier.

If the flock is managed well the fleeces should pay for its maintainance. During the year the average Southern ewe will shear about five or six pounds of fleece and wool has been selling for 25 to 30 cents a pound for the last five or six years. And then the spring lambs raised are a clear profit.

THE PRODUCTION OF BEEF ON THE HIGHLAND RIM.

By LIVE STOCK EDITOR.

Extending in a wide circle full around Middle Tennessee are ten thousand of square miles designated as "The Highland Rim." The type of soil found here is well known to the entire Southland. It is for the most part gray and crawfishy; and is notorious for its scrub oaks, barrens, and unproductive fertility. For years this land has been shunned by those looking for a farm home, and even the government has described it as fit only for national woodlots. During the last decade however, a new movement has been initiated which, although still in its infancy, is already slowly demonstrating that there is at least one system of farming profitable on this great plateau, that of raising beef animals.

With but a scanty supply of fertility left in the soil by Nature and considering the rapid depleting effect of the methods heretofore pursued, such as shallow plowing, use of commercial fertilizer and providing for no return of humus to the soil, it is little wonder that the efforts at hay and grain farming have been more or less non-remunerative. Even with the best known modes of cereal growing it is doubtful whether the small store of fertility could long endure their heavy draughts.

When a native from these regions once said, "The great thing about these soils is the fine chance for improvement," he undoubtedly meant more than he said. With a clay hardpan as a subsoil and considering the ease with which this type of soil can be handled, it lends itself unusually well to scientific methods of improvement. In experiments carried on by the State Agricultural Station, the productivity of this region was increased in two years from eight bushels of wheat to twenty and from sixteen bushels of corn to forty-five. (Bulletin No. 78, Tenn.) By applying stable manure, turning under green crops, and plowing deeply to hold the 48 to 50 inches annual rainfall, the production of this land increases by leaps and bounds.

If stable manure is to be an important factor in reclaiming this land the reader will no doubt ask himself why an intensive method of dairying would not be the most logical system to pursue. Were speedy development of fertility the only thing to be considered we would answer "Yes!" We must keep in mind, however, that the greater part of these regions are but sparsely populated; which condition together with the poor roads and inefficient means of transportation makes the marketing of milk and dairy products unprofitable.

What advantages are here open to stock farmers? In the first place the cheapness of the land makes possible large pastures; and on these because of the mildness of the winters cattle may be grazed 7 or 8 months out of the year. The wages in these communities are low. The labor required by this type of farming is small. Furthermore, when fed in carload lots the marketing of steers is relatively cheap. For these reasons it would seem that a well managed cattle range should be successful on the Highland Rim.

Let us see if these theories work out in practice. We have in mind three men who are engaged in beef production in this region. In the following we will describe their methods not only because they have been successful, but chiefly because they represent the three types of beef making, namely, winter feeding, summer feeding, and registered stock breeding.

Mr. Winter-feeder has a farm of about 240 acres all of which is under cultivation. He grows with equal emphasis corn, clover and wheat. In the fall he buys up a couple carloads of steers, usually the pick of the country. He feeds them for four months in a big, more or less open, round barn. He stacks his wheat straw in the center of the barn so that the cattle have access to it at all times and from which bedding is convenient. The steers have the freedom of a small yard enclosing the building. In this yard is a watering tank. They are fed and finished on a full feed of bright clover hay and ear corn, and are followed by hogs. The manure is allowed to accumulate on the packed dirt floor, sufficient bedding being added from time to time to keep it dry under foot. By the time the steers are sold in the spring, the manure covers the floor to a considerable depth. It is then hauled out and spread on the clover meadow before turning. With the exception of the N. from the clover roots and an occasional cover crop turned under stable manure is the only form of fertilizer ever used on this place, and yet its fields of corn might well be coveted by many owners of the most favored parts of Illinois.

The spring feeder has a 500 acre farm. Of this about 250 acres are cleared. A good deal of this land is hilly, rocky, and hard to cultivate; but this disadvantage is offset to some extent by the fact that the soil is high in lime contents making possible to have luxurient blue grass pastures and deep fields of clover. No definite rotation is practiced on this farm; but clover, timothy, corn, oats, and wheat are the principle crops; and the value of cow-peas in corn is well understood. The hillside fields are now nearly all in bluegrass. On his 250 acres of wooded pasture he maintains a herd of grade Angus cows which supply him 30 to 40 steers annually. In the fall of each year he picks up enough more feeders to give him at least two carloads. He winters his stock on a cheap ration of corn stover, clover hay, and his oat or wheat straw. Occasionally he gives them a little corn or cottonseed meal. In the spring he finishes the steers off on the blue grass with a full feed of corn-and-cob meal and cottonseed meal. This gentleman has made cattle a life-long study, and his superbly finished beef invariably top the markets. He does not market any pork but finds room in his wooded pasture for 75 to 100 ewes that provide for him yearly a carload of spring lambs. He probably makes more money than does the winter feeder, for he finishes his animals cheaper than can be done by the winter method, and since he feeds on fields altogether he is saved the expense of hauling manure in the spring.

The third gentleman operates with a still different method. In raising breeding stock to sell, one must main-

tain the herd at lowest cost and yet see to it that the calves keep a good healthy growth. With this in mind, he has fenced two wooded pastures of about 200 acres each, each containing clear, cold springs. Besides these there is another pasture of tame grass which is partly cleared. Upon the 200 acres cultivated are raised 200 tons of silage yearly, a field of equal size of corn for feeding. Soybeans and cowpeas, clover hay, and rye are each given a forty; while fifteen acres are reserved for a hog grazing rotation. During the summer, the cattle are grazed on the two woodland pastures, and although they are kept under close observance the only other expense is an abundance of salt and now and then a little soybean hay when the pastures are excessively short. When the wild growth of the wooded pastures gets too short the cattle are turned in on the pastures of tame grass and Japan clover. During the winter they are fed in an open shed, receiving a full feed of silage and a little cotton-seed meal. Besides this they have access to a fresh stream of water and a rack of shredded corn stover. The small expense with which this large herd is maintained throughout the year is almost beyond the belief of many breeders in the North who are still feeding their breeding herds corn and hay 5 or 7 months out of the year. Although the market for breeding animals is very unstable, and especially is this true in the South, by raising enough hogs to tide him through adverse times this gentleman is as much a success in his line as the two feeders before mentioned are in theirs. The fact that his cattle are bred to meet Southern conditions aids very materially in his sales and he takes advantage of this in his advertising.

The men above mentioned have owned their respective farms for eight to twelve years; and in this time their value has doubled and trebled. The winter feeder raises 20 to 25 bushels of wheat per acre. The clover fields of the spring feeder are the pride of the country. And the breeder has little trouble in harvesting ten to twelve tons of silage per acre. Not astonishing results and yet for their respective localities they are outstanding. Some of their neighbors attribute their success either to luck or to financial backing. Each one of these men, however, is a careful manager; they read much and keep up with all the latest agriculture magazines; they understand the value of stable manure, cover crops, and lime. These same characteristics combined with indefatigable industry not only brought success to them but will be a key to the same bounteous returns to anyone else who will properly use them.

TENNESSEE AN AGRICULTURAL STATE.

By JUDD BROOKS, '12.

In view of the fact that Tennessee is primarily an agricultural State and that the entire value of the farm crops reaches far into the millions, it is well to see how the yields compare with those of other states and how nearly they approach those that are being made by individuals within

her bounds. Notwithstanding the fact that corn is grown on practically every farm in the State, and that the total production is large, the average yield per acre is only 25.9 bushels. Tennessee's yields are nearly doubled by some states, still the average for the United States is 27.4 bushels to the acre. The average yields of wheat, barley, oats, rye and potatoes are respectively, 11.7, 23, 23, 11 and 80 bushels to the acre; the general averages for the United States are 14, 22, 4, 31.9, 16.3 and 55.5 bushels, and still some states make high yields of 30, 43.5, 46, 20.3 and 115.8 bushels.

It would be safe to say that Tennessee is not as well adapted for growing these crops as are many other states, if splendid yields of all of them were not produced in practically all portions of the State. Many farms in Tennessee are producing on an average of 50 bushels or more of corn to the acre, and some as much as 150 or 168 bushels. The same is true of wheat, barley, oats, rye and potatoes. Individual farmers produce yields four and five times as large as the average for the State. Four hundred bushels of potatoes and 38 bushels of wheat have been produced to the acre on the Barrens of Tennessee.

These comparisons do not show by any means that the methods practiced by the Tennessee farmers are poor, for such is not the case, but they do show that the agricultural production of the State might easily be doubled without using any more land or labor than is being used at the present. The double crop system might be used, however, with the single crop system, if the yield is doubled per acre, it would not only double the income, but also increase the percent of profit. Two bushels of corn or wheat would be grown where one formerly grew, and at a decreasing cost of production, for no more land would be necessary, very little, if any, more seed and just the same amount of cultivation and labor of harvesting.

IMMUNITY.

By JOHN R. TITSWORTH, '13.

By immunity is meant that an animal is non-susceptible to a certain disease under certain conditions. These conditions may occur naturally or be produced artificially.

Some species of animals are naturally immune to some diseases. For instance cattle never have glanders. Birds, under ordinary conditions, never contract anthrax owing to the high temperature of their bodies. If the conditions are changed and their temperature is decreased they will readily take the disease. So far we have considered a species of animals as a whole being immune from a disease to which some other species is susceptible. This is not the only form of natural immunity which is known, however. Individual animals are born with a certain amount of resistance for a certain disease in some cases. In a certain part of Algeria there is a type of sheep which are considered practically immune to anthrax. While this

was probably a characteristic acquired by a process of survival of the fittest it has become hereditary and is now considered a natural characteristic.

Acquired immunity is obtained in an animal by passing through an attack of the disease or by inoculation. The immunity which is acquired by passing through an attack of the disease may be either temporary or permanent.

Inoculation is divided into two classes, active and passive. Active inoculation is produced in an animal by an injection or series of injections of a non-lethal dose of the organism or its toxin. The organism when injected may be either living or dead or it may be a filtered bacterial culture. The living organism is always weakened before the injection. This may be accomplished in any one of four ways. It may be grown in oxygen for a certain length of time. The organism may be passed through the tissues of some animal which is resistant to that germ. Again it may be grown at abnormal temperature or in an antiseptic solution.

Passive immunity is brought about by the injection of serum from an animal which has been previously highly immunized by one of the previous methods.

Method of Prepairing Hog-Cholera Serum.

20 to 30 cubic centimeters of serum from a hog which has been perviously hyper-immunized is injected under the skin on the inside of the thigh up close to the body. At the same time 2 or 3 cubic centimeters of blood from a hog sick with the disease at about the same place on the other thigh. About a week later it is subjected to hyper-immunization. About 10 cubic centimeters of virulent blood is used for every pound of body weight of the hog to be inoculated. It may be done either by the "quick" or "slow" method. By the "quick" method this amount of blood is all injected at one time. By the "slow" method three injections are made about one week apart.

After the hyper-immunization the pig is now ready to produce the serum. The serum is drawn by bleeding at regular intervals. The bleeding is done by amputating the tail. The first time it is amputated just a little below the middle and each time it is made a little higher. From 300 to 600 cubic centimeters of serum is drawn off at each bleeding. The amputations are made at intervals of about one week. Generally a pig is not bled more than three times for the blood seems to lose its power.

The serum is filtered through a sterile gauze. 5% carbolic acid is added in proportions of 9 parts of serum to 1 part of acid. It will keep indefinitely in air tight bottles at ordinary cellar temperature.

There are two methods of inoculation. One is the serum method and the other is the serum-simultaneous method. 20 to 30 cubic centimeters of serum is a dose in either case. In the first method the pig is inoculated with the serum only. The immunity in this case lasts from 3 to 6 weeks. In the latter method 2 or 3 cubic centimeters of virulent blood is injected in the opposite thigh at the same time. This gives

an immunity which is practically permanent.

While the serum has some curative effects if given in the early stage of the disease its value lies principally in its preventive power.

THE VALUE OF THOROUGH MILKING.

By O. L. FARRIS, '15.

Few dairymen and farmers know the true value of thorough milking. In this one business ignorance of this fact is the cause of many mistakes, and nature like our country, excuses no person on account of ignorance of its laws. This very serious blunder is more prevalent among our farmers who have only a few cows than among dairymen, because dairymen have, as a rule, made a study of this question and know its evil effects. Thus we see that the damage is done to a small portion of our cows.

Most farmers put off milking until all their other work is completed and then try to milk in that tired and fatigued condition. The result of this is that when they get almost through they quit and leave what is commonly called the "strippings." The dairyman who has untrained milkers or men who care nothing for their employer's business falls victim to the same treatment.

The person who leaves the last few drops of milk in the cow's udder commits a triple offence against nature. First, he lessens that milk flow by not taking all the milk from the udder. If this is kept up, the cow, according to the familiar expression, will "go dry." This not only affects the milk flow of the present lactation, but also decreases it in all following lactations. Second, he lessens the value of the cow and all of her descendants. By milking, the udder is exercised and new milk glands are formed. Then by milking the last few drops we would exercise the udder more, thus increasing the number of milk glands, and causing a greater milk flow. This cow then would naturally produce a line of descendants, that by the same treatment, could be made produce still more milk. Third, he commits a crime because he loses for his employer dollars and cents every month for the last few drops are very rich in butter fat. The largest fat globules on account of their size are found in the last few drops drawn.

The large globules of fat pass through the opening of the teats with some difficulty, thus the watery portion of the milk will pass out first leaving the solids to be forced out later. The richest portion of the milk then is found in the last few drops that are milked. The following percents of butter fat in milk, according to the time of drawing, were found in the University Dairy Laboratory:

Amount of butter fat in first ¼ of milk drawn	.8%
Amount of butter fat in second ¼ of milk drawn	4.3%
Amount of butter fat in third ¼ of milk drawn	5.0%
Amount of butter fat in fourth ¼ of milk drawn	5.4%
Amount of butter fat in last few drops of milk drawn	17.5%

By the above, we plainly see that by losing the last few drops each

day, we should lose a large amount of butter each year. Let us suppose that an ounce is left at each milking and the cow gives 6,000 pounds (about 700 gallons) of milk per year. Then in the course of a year there will be a loss of $3.60 per cow in money, and the loss to the owner by injuring to the cow cannot be easily estimated.

We have in Tennessee one dairyman who, in order to get his cows milked thoroughly, offers a prize to the milker who draws the greatest number of pounds each month. By this he not only improves the cows, but after giving the prize he makes an extra profit from his herd. The dairyman can easily afford to pay the milker who milks thoroughly more wages than one who does not. For sake of animal improvement, let us try to remedy this evil.

C. A. Hutton, '13, spent a few days recently at Columbia, Tenn., testing some Jersey cows for the Advanced Registry.

EVENING AT THE FARM.

Over the hill the farm boy goes,
His shadow lengthens along the land,
A giant staff in a giant hand.
In the poplar-tree about the spring,
The katydid begins to sing;
The early dews are falling;
Into the stone heap darts the mink;
The swallows skim the river's brink;
And home to the woodland fly the crows,
When over the hill the farm-boy goes,
  Cheerily calling,
  "Co', boss! co', boss! co'! co'!"
Farther, farther, over the hill,
Faintly calling, calling still,
  "Co', boss! co', boss! co'! co'!"

Into the yard the farmer goes,
With grateful heart, at the close of day;
Harness and chain are hung away;
In the wagon-shed stand yoke and plow;
The straw's in the stack, the hay in the mow,
The cooling dews are falling:
The friendly sheep his welcome bleat,
The pigs come grunting to his feet,
The whinnying mare her master knows,

When into the yard the farmer goes,
  His cattle calling:
  "Co', boss! co', boss! co'! co'! co'!"
While still the cow-boy, far away,
Goes seeking those that have gone astray—
  "Co', boss! co', boss! co'! co'!"

Now to her task the milk-maid goes,
The cattle come crowding through the gate,
Lowing, pushing, little and great;
About the trough, by the farm-yard pump,
The frolicsome yearlings frisk and jump,
While the pleasant dews are falling:
The new milch heifer is quick and shy,
But the old cow waits with tranquil eye,
And the white stream into the bright pail flows,
When to her task the milk-maid goes,
  Soothingly calling,
  "So, boss! so, boss! so! so! so!"

To supper at last the farmer goes,
The apples are pared, the paper read,
The stories are told, then all to bed.
Without, the cricket's ceaseless song
Makes shrill the silence all night long;
The heavy dews are falling.
The housewife's hand has turned the lock;
Drowsily ticks the kitchen clock;
The household sinks to deep repose,
But still in sleep the farm-boy goes
  Singing, calling—
  "Co', boss! co', boss! co'! co'! co'!"
And oft the milk-maid, in her dreams,
Drums in the pail with the flashing streams,
Murmuring, "So boss! so!"

Ex.

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EDITORIAL.

It might be of interest to our readers to know something of the young stuff now in the University dairy herd. These animals comprise the offspring of such noted bulls as Exile's Landseer, Loate's Noble, and Golden Lad of Ingleside.

The young bull, Agatha's Eminent Landseer, by Exile's Landseer, is remarkable for his extreme fine quality and finish. He also has excellent capacity and constitution. Not only is he an excellent individual, but his breeding is of the very best also. He is descended from a very high testing family of cows, and also carries the blood of the great bull, Eminent.

The seven months old calf, Baronetti's Noble, by Loate's Noble (a son of Noble of Oakland) and out of Baronetti's College Girl, has a great capacity and constitution, good style and finish. His granddam, Belle Baronetti, has an official record of 796 pounds butter in one year. Another promising young bull is by Golden Lad of Ingleside, out of Major's Queen Leona. These are all excellent individuals, and should develop into bulls of "top notch" quality.

The Station is offering for sale a solid color bull calf, by Golden Lad of Ingleside, and out of Foxy Juliet, a heifer with record of 38.7 pounds butter in 30 days. This calf should make a fine herd bull, and the man who buys him is sure to get a bargain. Another young bull of equally good dairy conformation, by the same sire, and out of Major's Lady Tippens, is for sale also. There are several other fine specimens in the calf barn, but one of Golden Lad of Ingleside's heifer calves, out of Matilda's Gay Princess, completes the list of calves for sale. She is a splendid individual, showing good capacity and constitution.

That an education to the farmer has a great money value, has been shown by Dr. J. H. Weber, dean of the Cornell College of Agriculture. Men from the Cornell Station, as cited in Bulletin 295, visited many farms and secured accurate data of

the farmer's income from his own labor from 573 men. All expenses, hired labor, five percent on capital invested from the gross receipts, and the depreciation in apparatus, tools, etc., were deducted. It was found, then, that the 398 farmers who had attended only the district schools had an average labor income of $318.00 annually, while the 165 who had attended high school received an income of $622.00, and that the ten college men earned $847.00. Then if the farmers are classified and arranged in groups, having equal capital, the labor incomes are:

Capital	District Schooling	More Education
$ 2,000 and under..	$ 187.00.....	$ 286.00
2,001 to 4,000....	241.00.....	275.00
4,001 to 6,000....	398.00.....	466.00
6,001 to 8,000....	395.00.....	709.00
8,001 to 10,000....	618.00.....	796.00
10,001 to 15,000....	525.00.....	1,091.00
15,000 and over ..	1,054.00.....	1,272.00

It was found that the farmers with a college or high school education made much better returns on the money invested than did those with only a district school education. In every case, farmers with the better education use their capital more efficiently. Furthermore, there is an increase of $304.00 per year in the labor income of those men who have attended high school; in other words, a high school education is worth more than $6,000.00 in five per cent bonds.

From the above data, which has been collected from only a few representative farmers, and perhaps the ten men who were college graduates had not taken the agricultural course, shows that the farmer boys can profitably invest a few years in a high school or better an agricultural college in order to become farmers of greater executive ability.

"Seed Bulletin No. 1 issued by the Department of Agriculture is now ready for distribution and can be had by writing A. L. Garrison, Chief Feed and Seed Inspector, Nashville, Tennessee." Every real farmer of Tennessee should have one of those bulletins, and after procuring it, he or she should study it carefully in order to become acquainted with the seed and feed standards of our state.

The low yield of corn throughout Tennessee, and in fact, the South as a whole, could be prohibited to a great extent if more systematic or scientific methods of cultivation, seed selection, rates and time-of-planting were practiced.

As it is, many farmers plow their fields late in the spring, harrow them once or twice and plant the seed in a poorly prepared seed bed. A more ideal and profitable method is to plow where the character or the topography of the soil will permit during the winter, unless a cover crop has been sown on the field in the fall and there the manure crop compels the farmer to wait until late in the spring to plow, in order to obtain the desired results from the cover crop. The fields should, after plowing, be worked over several times with the roller, disc and spike tooth harrow. This kills weeds and helps to warm the soil for planting.

The seed corn should be selected for the percent of germination because that is a most important factor when high yields are anticipated. Suppose, for example, a field is

planted to Reed's Yellow Dent variety of corn, the seed being inferior, at the rate of 10,000 stalks per acre if all the kernels germinate. This stand should produce, if each stalk bore one good ear, counting 100 ears to the bushel, 100 bushels to the acre. But since one-third of the seed is inferior, only two-thirds of a stand is obtained, and after the usual enemies, as bud and cut worms have done their damages, only sixty per cent of a stand is left. This leaves 60 bushels to the acre where the return should have been 100.

Not enough attention is being given to the stands of corn throughout the state. Only last summer some very thorough investigations were made in order to determine the amount of missing stand in many fields. Just one or two fields were found having a stand of more than 90%, and many with from 50% to 75%. Hence it can be seen what it means to have a perfect stand on the field. It means from 25 to 50 bushels more return per acre on some fields.

RELATION OF SIZE, AGE, AND WEIGHT TO FECUNDITY AND TO THE OFFSPRING.

By R. H. FELTS, Jr., '12.

For quite a number of years the question as to whether fecundity and the offspring were affected directly by the size, weight and age of the parents has received considerable attention and has been widely discussed, but only during the last few years have any experiments been conducted to determine just what relation these factors bear to fecundity and to the offspring. Various experiment stations and scientists have carried out breeding experiments, some with sheep, some with chickens, others with various animals and grains, and have shown that the offspring is affected by size, weight and age of parents, and the fecundity, or fertility, of the female is dependent upon her size, weight and age.

Experiments were made at the West Virginia Station to determine the effect of the age of the parents upon the vigor of the chickens. Some of these will be briefly described below.

Three pens of single comb White Leghorns were used. Pen 1 consisted of pullets, pen 2 of hens 2 years old, pen 3 of hens three years old. All were of the same strain, and were fed and handled in the same way. The cocks with which they were mated were alternately placed in the different pens in order to eliminate any possible effect resulting from the individuality of the males. The three year old hens were selected with reference particularly to size and apparent vigor.

The following table shows the number of eggs incubated from each lot of fowls, the weight of the eggs, the weight of the chickens when removed from the incubator, and other details of the test. A cyphers incubator was used and it was started June 3, 1907.

	Pen 1	Pen 2	Pen 3
No. of eggs in incubator	55	79	74
Weight of eggs per hundred	11.50 lb.	12.18 lb.	14.29 lb.
Tested out as infertile	8	9	5
Unhatched	2	10	9
No. of chickens	45	60	60
Per cent of eggs hatched	81.8	75.9	81.1
Weight of chicks per hundred, when removed from incubator	7.33 lb.	7.54 lb.	8.47 lb.

Eggs and chicks from hens three years old were heavier than from younger fowls.

Three other tests were made with eggs from the same pens and in each case the eggs and chicks from oldest hens were heavier than those from the younger hens, and the chickens were more vigorous and made greater gains in weight during the first forty days of their life.

Four other experiments were made with eggs from well matured, vigorous hens, and with eggs from young hens less than one year of age. Each showed that the eggs laid by the mature hens were heavier than those laid by the younger fowls, and hatched chicks which were larger, stronger, and grew faster than the chicks hatched from the eggs laid by the younger fowls, and fewer of the chicks from eggs laid by old hens died during the first 20 to 26 days.

The results of this series of experiments clearly show that it is a matter of prime importance to have the breeding stock vigorous and well matured.

Experiments made at the Maine Station during the hatching seasons of 1908 and 1909, show the same general quality of eggs measured by the per cent of fertile eggs hatched is an inmate constitutional character which is definitely inherited in the female line.

L. R. Waldron, of Dickinson, N. D. made plantings on May 18, 1909, of small seed from large plants, large seed from large plants, small seed from small plants, and large seed from small plants. On May 26th, all were up about ¾ inch. Care was taken to secure uniform depth of planting and the soil was apparently in uniform condition. On June 11th and July 12th, the height of the plants grown from the different grades of seeds was taken and in each case the height of the plants from the large seeds from the large plants were found to be greatest, and the plants from the large seed from small plants were taller than plants from small seed from large plants; the plants from small seed from small plants having less height than any of the others.

Excessive fatness may result in lessened fertility of animals simply by blocking, or the anatomical derangement, of the fallopean tubes, and the consequent in capacity of the ova to gain access to the tubes, owing to an excessive deposition of fat in that region. Such infertility may, however, be of a transient nature and may be remedied by a reduction in quality of the food supplied, or by an increase in amount of exercise, and this seems to accord with the results of actual practice. Also it has been shown that the offspring of animals declining in vigor are not as strong as of those in their prime.

R. E. Lloyd, in the Record of the Indian Museum, No. 3, records an experiment made with 1,000 female house rats of India whose weight varied from 50 to 210 grams. Correlation tables are presented which do not show any correlation between size and fertility. The mode or number of young in a litter occurring with greatest frequency was five.

In a test to compare the germination of the heavier and lighter kernels in the same head of wheat, which was made at the Kansas Station in the fall of 1909, it was shown, (1) that a difference of over one per cent exists between the germination of the heavier and lighter kernels of the head in favor of the heavier, (2) that the heavier kernels do not exceed the average as much as the lighter ones drop below it. A second test was run to compare the germination of the larger and the smaller kernels as separated by graduated sieves. The result of this test indicates, first, that there is a slight difference between the germination of the larger and the smaller kernels, but that this difference is not constant; second, that the largest kernels usually, although not always, germinate best; and third that the smallest kernels usually, although not always, germinate the poorest.

The conditions which determine the birth weight of animals are not well understood and it seems that investigators have paid little attention to this class of facts. The birth weight of animals in many cases seems to be closely related to the subsequent growth and development of the young animal, and in general it may be said that a comparatively heavy birth weight is desirable. Experiments were made at the Missouri Station which throw a great deal of light on this question. Breeding experiments with sheep were conducted during a continuous period of four years. The ewes were natives of mixed breeding, and were as a whole decidedly common. These were bred to pure bred registered rams of the Hampshire, Shropshire, and Delaine Merino breeds. The flocks bred to the rams of different breeds were cared for under the same conditions during the experiment. In the general averages and elsewhere all lambs born dead were eliminated from the calculations.

In the report of this experiment a table was given to show the relation of the breed of the ram to the birthweight of the lambs. A summary of this table is as follows: Birthweight of 41 half blood Hampshire lambs 7.83 pounds each; birthweight of 33 half blood Shropshire lambs 8.41 pounds each; birthweight of 36 half blood Merino lambs 7.70 pounds each. A second table was presented to show the relation of the weight of the ram to the birthweight of the lambs. A study of this table shows that there is no definite relation whatever between the birthweight of the lambs and the weight of the rams. A third table which was presented showed that the weight of the dam materially affected the birthweight of the lamb. The heavier the ewe the greater was the birthweight of the lamb, and the birthweight seemed to increase with considerable uniformity and in direct relation to the increased size of the dam.

Other tables were arranged which showed that the average birthweight

of male lambs was greater than of the female lambs, and that the males made a greater weekly gain a period of seven weeks than did the females. Also it was found that the heavier the lambs were at birth the greater gain they made, showing that it is important to have as great a birth weight as possible.

The following general conclusions may be drawn from these observations:

1. The birthweight of lambs is largely or entirely controlled by the mother.

2. The lambs having the greatest birthweight were from the heaviest ewes. The birthweight of lambs and the weight of their dams seem to be closely related and vary together.

3. Neither the breed nor the size of the rams used were determining factors in fixing the birthweight of the lambs.

4. Male lambs were 16 per cent heavier at birth than female lambs.

5. The gains of the lambs for an average period of seven weeks were decidedly in favor of the lambs having a heavy birthweight.

A VISIT TO McNUTT'S VEGETABLE GARDEN.

By JESSE SHAVOR, '15.

Wednesday evening, March 6th, Professor Keffer took his Sophomore Class in Horticulture to Mr. McNutt's greenhouses east of town for a rather hasty examination of their structure and the different vegetables growing therein. Our examination included hotbeds, cold-frames and outdoor vegetable gardening. Our attention was first called to the lettuce in the hotbeds. These beds, Mr. McNutt prepares in practically the same way as everybody else except that he puts a compost of spent manure from last years hotbeds with a very little soil—about nine parts of manure to one of soil—over the manure instead of garden soil. In a very few weeks after sowing, the lettuce is ready for transplanting, the tender plants are reset in the cold-frame four by four inches apart. As soon as the plants reach a certain size, three-fourths of the plants are removed to other beds. This gives the remaining plants room to mature. Besides lettuce, Mr. McNutt grows cabbage and tomato plants in hotbeds and cold-frames. He stated that he did not use any covering over the sash in cold weather.

Next, we inspected the greenhouses, first visiting one containing sweet peas. The vines were covered with thousands of flowers whose fragrance completely filled the room. In a vacant place in the greenhouse, lettuce was being transplanted. The house was made with a V shaped roof which came to within five or six feet of the ground and was covered with large sized glass. The top row of sash next the crest on the south side was hinged so that as many as twenty-five sash might be raised at one time to admit air. The inside supports are made of hollow iron pipe, ideal supports because of their

strength, permanency and size—these rods being so small that they retard the sun's rays very little. The bars on which the sash rest are made of 1½"x2½" scantlings with a little groove on each side to drain off the drip. The buildings are all steam-heated through a system of pipes from one boiler; while water is supplied through the Skinner system of irrigation, city water being used entirely. This system has the advantage of throwing a very fine spray which washes the leaves and refreshes them somewhat as a rain. The paths are eighteen or twenty inches wide and about eight feet apart.

The house next to this was planted in roses and lettuce, companion cropping being employed. The lettuce was in fine condition, but the roses had not done so well, many of their leaves being attacked with mildew.

Nearby was a rather carelessly built greenhouse in which violets were growing. These structures are not made very tight because violets do not require a very high temperature, nor very permanently because the structure is removed in the summer and other crops grown on the same soil. Violets are never grown in the same soil twice in succession because of the great danger of diseases. These flowers are propagated by rooting the side shoots. Many florists make more money off of a small bed of violets than most farmers do from ten acres of corn.

As we walked towards the vegetable garden, the fact was brought out that Mr. McNutt applies from seventy-five to one hundred loads of barnyard manure to the acre every other year. Manure costs him one dollar a load delivered. He depends entirely on manure for his humus, although he does raise a little rye for his chickens. A patch of kale, in the vegetable garden had been almost ruined by the severe winter. Mr. McNutt said that three crops of beans could be grown on the same ground after the kale had been harvested. Close by was an example of companion cropping, spinach and onions. His most valuable vegetable crop is beets. The beet plot had been heavily manured and plowed in the fall, and at the time of our visit, a good surface dressing of spent hot-bed manure was on the ground to be disced in before planting the seed. Beets and radishes are grown together, the rows of beets being planted twenty inches apart with a row of radishes between. The radishes mature before they seriously interfere with the growth of the beets. His cabbage did not look very well. He prefers cabbage plants grown on the coast of South Carolina, because they are hardier than those grown in this climate and will stand a harder freeze; indeed he says that they will even survive a temperature of ten degrees. In ordinary years, he transplants into the open about the twentieth of January. His rhubarb plot was being covered pretty heavily with fresh stable manure. This work must be done before the soil is dry enough for tillage, to secure the best results. The nitrogen leaches down into the soil and stimulates quick growth. Mr. McNutt then showed us a bed of rhubarb being forced for the early market. The sash were covered with old mats to keep the

light out. This makes a long, tender leaf stalk. Rhubarb is forced by allowing the roots to freeze and then placing them in a hotbed which has lost most of the heat produced by the fermenting manure. For best results in field culture, this plant should be taken up every three years, divided and reset. It is generally divided into as many parts as there are eyes.

One thing about these gardens that struck some of us country boys was the absence of trash and rubbish on the premises and finding all tools securely housed. But I suppose this last is necessary in a place so near the city.

CORRELATION OF CHARACTERS.

By JUDD BROOKS, '12.

For many years the question of correlation or association of character has been considered a very simple one. Of late, however, this attitude has been completely changed, and the intimate nature of qualities and characters has become an object of very deep interest to the practical breeder as well as to the student. Experience, one of the best teachers, has taught that qualities and characters are often associated or correlated with one another by distinct laws, and that a knowledge of these laws may furnish the breeder or student a power over them greater than anyone has aspired heretofore. Even a suspicion of the meaning of these laws may lead to valuable results, if only used in combination with a thorough knowledge of the species in question.

In order that the breeder may make the most use of correlations which he finds, it is best that he should know, if possible, of the physiological or genetic relation between the characters concerned.

There are two main types of correlations recognized:

1. Correlated variation in which type variation in the expression of one character or in the development of one organ is accomplished by a corresponding variation in the manifestation of some other character.

2. Correlation between unit character in which certain characters are associated in their inheritance. Two characters are correlated in this sense, when one accompanies the other in every case, or oftener than is expected according to the law of chance.

In correlation of unit characters there is a distinction made between gametic coupling and spurious allelomorphism. To illustrate gametic coupling the case of sweet peas may be taken, in which, in the second generation hybrid it was discovered that there was a numerical correlation or association between the long type of pollen grains and purple color, and between round pollen grains and red color. The blue factor causing the purple color appeared to be inherited with the long factor seven times as often as with the absence of the long factor. On the other hand, however, absence of the blue factor leaving the flower red was inherited seven times oftener

with the round pollen grains as with long factor.

Spurious allelomorphism is the term applied to the case of second generation sweet peas when the factor determining the erect form seemed to be allelomorphic to the blue factor instead of each factor being paired with its absence. Thus there appears a perfect correlation between red color and erect form.

Only correlations of unit character or gametic correlations has been applied to breeding. For example, Nilsson of Sweden, found cultivated there a variety of barley having stiff culms, hairy scales, and a large coarse kernel. The barley plant having some of the desired characters correlated was selected as a brewer's grain. The study of the correlations between morphological and individual factors lead to the discovery of the correlation of hairs at the base of the scales and the albumen content of the grain. Long and straight hairs were associated with coarse kernels, but short and crisp hairs were correlated with those qualities which made the barley famous as a brewer's grain.

It is stated by DeVries that a correlation between a certain kind of hariness of the leaves and doubling of the flowers in stocks enables the grower to discord large proportions of the singles in the seedling stage.

Correlation in certain sweet corn hybrids have been made use of. Here the bluish color of the kernel was found correlated with the green color of silks, glumes and stamens, and bright amber or white color of kernels with red or purple silks, glumes and stamens. It could be told when the plants were in flower what would be the color of the grains.

It is common experience that many color varieties of plants may be distinguished and isolated by their seed. In some plants a dark color seed is correlated with a bright flower, a pale seed is usually associated with white or pale corollas. The stock flower has grayish, brown or bluish seed according to the correlation of the color of the petals.

A correlation has been observed by Darwin between the size of the seed and the time of germination. The smaller seed have thicker and more water resistant seed coats which causes them to be dormant for a long time. The large seed having large kernels germinate uniformly and they are more vigorous. These factors should be evidence sufficient to warrent the selection of seed with such correlated characters.

At the Illinois station, they have been breeding corn in two directions by straight selection to increase the height of the ear on the stalk in one variety, and to lower it in another variety. They have succeeded in producing two strains with the desired correlation. In one variety the ear has been raised three or more feet.

There is a correlation between the ear and the protein content of the grain. Ears of corn producing grains which are medium to long in length and which are bright, are the highest in nitrogen content, and cylindrical ears, smooth ears and selected ears of medium weight have the highest nitrogen content in the grains. It has been found, too, that heavy weight of leaves of

grain, of stover, of fodder and low percentages of grain to the weight of fodder are correlated to nitrogen content. Nitrogen content increases with the ash and crude fiber. Greater weight of grain is correlated with greater leaf surface, and in fact, the whole vegetable weight of the plant. The percentage of grain to ear is correlated with the percentage of grain to the total weight of the plant. High percentage of grain is correlated with low percentage of stalk.

A theory on the mechanism of correlation has been advanced. Here many examples are cited showing that many organs of the body produce hormones or secretions that effect the form or structure of the organ, external as well as internal.

An important set of bodily correlations are those that exist between the reproductive glands, and the secondary sexual organs such as the comb, hackles and spurs of the common fowl.

If the genital glands of the young fowl are removed before maturity, it will fail to develop the secondary sexual organs and it will not have the appearence of a male. However, if a small piece of male gland is grafted into a young casterated fowl, the comb, hackles and spurs will develop as usual with a normal fowl. It is, therefore, very probable that the reproductive glands produced hormones by which the secondary sexual organs are determined.

Certain correlations have been worked out with holstein cattle, measurements of a large number of cows of proved merit and known capacity—as expressed in figures of milk and butter records—have been taken. This comparison enables the breeder to be in a position to deduce the true principles of cow structure.

The advanced Register divided the cows into three classes as follows: 108 cows of the "milk and beef" form having an average record of 18 pounds and 14 ounces of butter in one week; 86 cows of the milk form having 18 pounds 10 2-3 ounces and four of the "beef and milk" form average 16 pounds 7 ounces butter. Here the cow of the milk form has fallen short by a few ounces of the production of the cow of milk and beef form, that is, the cow is inclined toward the general purpose type.

Another lot of cows were measured, some cows produced 20 and some 30 pounds butter in a week. It was found that the 30 pound cow was 1.47 in. more in the girth than the 20 pound cow.

The 30 pound cows differ from the 20 pound in other structural forms. Higher hips, longer rumps and greater width of thurl which indicates a larger and more roomy pelvic basin. Looking for indications of "femininity" this is the place to look for them above all others.

It is then believed that the breeder can go into a herd with tape and rule and pick out the best dairy animals by the correlations as shown by measurements.

With the breeders of the twentieth century it seems that the problems of selection for the desired results should not be so difficult, because he can select the varieties of corn, oats, wheat, barley, flowers, also for milk production, by keeping in mind the correlations which exist between the characters as cited in this paper.

THE FUNCTION OF ASH IN THE ANIMAL BODY.

By C. E. ALLRED, '12.

Ash is the inorganic portion of the animal body, and is determined by burning the body and analyzing the resultant ash.

It has been determined that a fat calf is 3.8% ash; a half fat calf 4.66% ; fat ox 3.92% ; lean pig 2.67%. Hogs have the least mineral of any farm animal.

An animal fed on food destitute of minerals dies of mineral starvation During mineral starvation the nervous system is the first to suffer perceptibly; then follows weakness of limbs, trembling of muscles, convultions, great excitability, and the animal dies sooner than it would have done if no food at all had been given.

Because of their limited diet, in which there is no hay rich in mineral matter, pigs suffer oftener from lack of mineral matter in their food. Pigs grow from 40 or 50 pounds up to 75 or 100 pounds without mineral matter, then loss of weight begins and collapse soon follows. A 50 pound growing pig should have 4 to 5 grains of phosphorus daily.

An experiment carried on at Wisconsin shows the value of salt to milch cows. No bad effects were at first noticed but before long they seemed low in vitality, took on a hazzard appearance, and finally broke down. If either sodium chloride or potassium chloride is given to them they soon recover, showing that the trouble was due to a lack of chlorine. They are most apt to break down just after calving, and those giving largest quantities of milk break down first. The effects of salt seem to be to lessen protein decomposition, serve as a spice, stimulate appetite, increase palatability, stimulate secretion of digestive disturbances.

Metabolism in the body is directed in some manner by mineral salts, though in just what way is not understood. The various minerals have different uses in the body. The blood serum is rich in sodium chloride and other sodium salts, while the red blood corpuscles are rich in the potassium compounds. The nuclei and nervous system are rich in phosphorus, and the skeleton in calcium combined with phosphorus. The power of blood to carry oxygen is due to hemoglobin, an iron-protein compound in the red corpuscles. Blood deprived of calcium does not coagulate or clot. And pepsin in the stomach acts only in the presence of an acid derived from the salts of hydrochloric acid in the circulation.

Large amounts of lime and phosphorus are deposited in bones, chiefly as phosphates, but some as carbonates. Bones act as a sort of storehouse for minerals, ashing them out when supply in food is insufficient, in order that metabolic processes may be continued. Lack of lime and phosphorus makes the bones porous and brittle, this occurring oftenest in mother carrying young, as the fetus stores up considerable mineral matter.

Young animals are most likely to suffer from lack of mineral matter because with them bones are being formed quickly and 60 to 70% of

the bones are ash. Young animals fed on food low in mineral matter are attacked by rickets, joint swelling, limbs and spinal column become crooked, teeth remain small and soft, and animals become unable to walk. Lambs can use and assimilate calcium phosphate, bone ash and steamed bone; calves calcium phosphate and calcium carbonate; and pigs precipitated calcium phosphate, bone ash, and ground rock phosphate. Over one-half of the mineral matter in food eaten by young animals is stored in their body, while old animals void much of it in their urine and feces. Even with normal rations, added calcium phosphate is absorbed by young animals and increased bone formation results. Of course the more rapidly the suckling grows the more need there is for ash to form the bones, so those species of animals which grow fast should have large quantities of ash in their diet.

There are some diseases resulting from a lack of ash. These are acidosis in infants, diabetes, osteoporosis, "Bran disease" in horse, rickets and osteomalacia in both man and beast, malnutrition of the bones, and bones of bad quality in general. Sulphur is a necessary constituent of the food-proteins.

The most important mineral constituent of the flesh is potassium phosphate, while that of bone is calcium phosphate. While other necessary minerals are soda, lime, magnesia, chlorine, and iron.

Mineral matter is absorbed principally from the small intestines and is usually unchanged in composition—that is only such changes occur as would take place outside the intestines under the same conditions.

There is a "margin of safety" for phosphorus and calcium in the animal skeleton. When animals are starving for phosphorus they draw these elements from the bones, and may withdraw much more than the margin allows. It has been found that variation in the supply of potassium, magnesia and phosphorus did not alter the amounts of the elements in the milk secreted by milch cows, a cow in three and one-half months giving 5½ pounds of lime more than was in the food given her. This was 25% of all the lime in her body at the beginning of the trial.

Mockern observed beneficial results from feeding steers with brittle bones or 30 to 50 grams of calcium phosphate in their daily ration. Phosphorus is also necessary for the formation of nucleo-proteins, or nucleus. In considering soft water as to its mineral content we should note that it is sometimes low in lime only, though often low in phosphorus also.

Legumes are especially high in lime as compared with their phosphorus content, and part of their value as a food is due to the fact that they neutralize the high phosphorus content of such foods as corn, stover, straw, wheat, oats, linseed oil, cake, etc. For there must be enough lime present to go into combination with the phosphorus. Mature corn is highest in percentage of ash, while the first two cuttings of alfalfa are markably higher than the succeeding cuttings.

In order that digestion may take

place it is necessary that chlorine be present for the formation of hydrochloric acid.

So, broadly speaking, we can sum up the functions of ash under five heads: (1) Construction (2) Digestion (3) Carries oxygen and Carbon Dioxide into the blood (4) Helps control muscular contraction (5) Helps in Regulating the Bowels.

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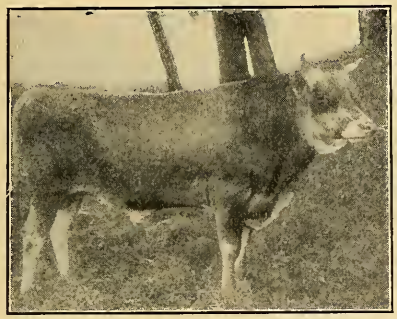

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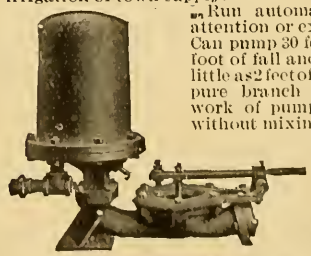

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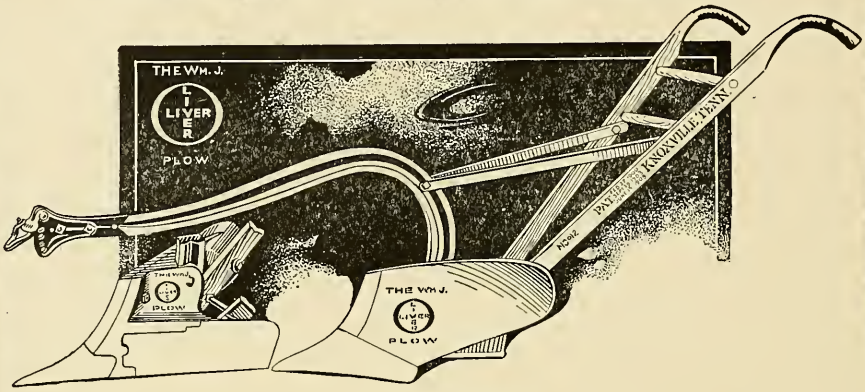

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THE U.T. FARMER

EXPERIMENT STATION BARNS.

Vol. VI. MAY, 1912 No. 8

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THE U. T. FARMER

Vol. 6. MAY, 1912. No. 8

THE EDUCATIONAL VALUES OF AGRICULTURAL SCIENCE

By J. C. McAMIS, '12

There is a new movement in our educational atmosphere; a movement singularly progressive and genuine, having for its purpose the uplift of rural life by the application of modern science to the practice of agriculture.

Progress and universal education are kindred ideals, symbolic of this generation, and related to each other as closely as cause and effect. No true progress is possible without real education. Perhaps nowhere can the progressive spirit be said to be more truly alive than in our educational world, exampled particularly in the phenomenal strides which we are witnessing in agricultural training. Recall if you will the recent growth of the College of Agriculture in our own University. In 1907 the total enrollment was 24, and there has been a steady increase since then until in 1912 it is 80.

The conservation educational philosopher is charging us with promoting the decay of that which makes for liberal training and personal culture. He is demanding a positive statement of the value of agricultural science in his plan for a higher education.

Most men agree that the ultimate aim of education is adjustment to environment. It must teach man how to live in relation to nature, his fellowman and his Creator. In order to fulfill these requirements, the theory and practice of agriculture must contribute to man's intellectual, aesthetical and moral development.

We hear a great deal of praise for modern science because of what it is accomplishing for human progress. It is revolutionizing our thot and life because it is giving us the power to use nature's forces for our own advancement. But science has had no greater message for any man than it has had for the agriculturalist. Surely to him "she speaks a various language." It is true that he has been slow to heed the call, but at last he is awakening to receive the generous gift, not of one of the sciences, but of all of them, and in appreciation thereof, he is weaving their essential principles into a new and durable fabric, the Science of Agriculture; and just as any fabric must possess something of the quality and character of the thread from which it is woven, so agriculture must possess some of the educational value of the science on which it rests.

The first aim of a cultural education is intellectual development. It begins by training the mind to observe and to draw correct conclusions. Agricultural science is as complex as the laws of life with which it deals. How best to raise a

single plant is lesson enough for a life-time. How to analyze the soil and to plan a suitable crop rotation calls into play the inductive method of reasoning in which the mind passes from the known to the unknown—not on the authority of Latin grammars or Webster dictionaries—but rather on the authority of observed facts. I do not fear contradiction when I say that to learn the essential elements of plant food, to successfully combat the insect enemies, and to solve the numerous problems arising in the garden, the orchard, the field and the forest, demands the highest type of knowledge, the greatest skill in technique and the broadest range of mental power.

But education must fit a man for the enjoyment of nature, of literature and of the fine arts in all their forms. It must teach a love of the beautiful. And even here science is lending a helping hand. The sculptor is aided by the study of anatomy—the musician should know something of physiology and physics—the painter who would best portray Nature must first know her—the horticulturist who would truly enjoy the successful production of plants must recognize the laws of plant life. He who would possess the highest appreciation of any of these arts will be aided by a study of the science upon which they are related. Literature itself has taken on a richer and deeper meaning by the association with science and nature. Education need yield none of its aesthetical qualities by the introduction of agriculture because the highest of the arts is based upon a part at least of the same science which is so fundamental in the art of the field.

True education means more than this. It includes also moral development and a cultivation of a spirit of loyalty to society and law. It must fit a man to perform justly and wisely the duties of citizenship. The majority of the greater issues of government are economic and hence scientific. Laws are rapidly being passed making for forest conservation for sanitation and the control of diseases of both plants and animals, but we cannot hope for a general observance of them until the facts upon which they are based become the common property of the community. A man cannot know the harm of needless destruction of the forest until he knows the laws of forestry and their relation to human welfare. These facts are the essence of agricultural science and a proper study of them will create a new patriotism and a new devotion to order and law and will help to secure the future of the American democracy.

And it will do more than this: it will help to reveal man's relation to his Creator. Agriculture is a science and "true science and true religion," says Professor Huxley, "are twin sisters and the separation of the one from the other is sure to prove the death of both." Science will free religion from its mystery and superstition and replace them with truth and sincerity. The moral value of the study of Agriculture is summarized in these lines of Tennyson:

"Flower in the crannied wall,
I pluck you out of the crannies,
I hold you here root and all in my hand
Little flower—but if I could understand

What you are, root and all and all in all
I should know what God and man is."

Let no one suppose that the student of agriculture is loosing his interest in a liberal education: let no one think that he lacks an appreciation of literature and language for well he knows that language is the hand maid of science and the key to wisdom. He knows that the lessons of history are as valuable in agriculture as they are in law or medicine. He believes in a liberal education but he is demanding a revision of the philosophy and methods of attaining it. He believes that agriculture science has a high educational value, and when properly joined with scholastic subjects in the corriculum, it will give to the graduate a breadth and finish of culture comparable with those of any other course, but he is demanding in addition that it be practical and economical.

Whatever we say of the educational value of agricultural science, and it is much; whatever the songs we sing of the glories of country life, of free air, of twittering birds, and blessed sunshine, and they are many, after all farming must pay, it must be profitable and productive. We must feed and clothe ourselves and the world and it will require the clearest of thinking and the highest development of mental power. Permanent agriculture is a problem which has never been solved. No nation has ever yet learned to feed itself except at the expense of its own or some other country. Other races have come up against this problem and have gone down under it. What shall our people do when there are no more new worlds and no "out West" to draw from, and that time is not far distant.

The science of Agriculture alone is able to save the day. How then, shall we say that it forfeits its birthright in a higher educational system simply because it is economic and productive? Does knowledge loose its cultural value because it is practical? We believe it does not. We believe that learning may be at the same time useful and educational. We believe that agricultural education is education indeed—genuine, real education, producing mind changes, a changed being, equipped with the power and the desire to odserve, to reason and to do things.

The Science of Agriculture has brought into its highest activity and greatest usefulness that bright, keen, beautiful weapon, the hoe, mightier than the sword which has been and is, the instrument of peace and plenty, the symbol of civilization, enlightenment and progress.

THE VALUE OF OFFICIAL TESTING OF DAIRY COWS

By C. A. HUTTON, '13

There are three classes of dairy records: mere pedigrees, which make it possible to trace the ancestry of an animal, showing the blood which courses through its veins; show ring records, which are mere chronicles of success in the ring where other animals are brought into competition to determine which are the most excellent in type, form and conforma-

tion; and last but by no means least, records of milk and butter production. This last class of records may be further divided into private herd records and official records. All of these forms of dairy records have their own peculiar places in modern dairy practice, but at this particular time we wish to discuss some of the merits of official records.

As dairy farming becomes more intense, as competition becomes keener, land values increase and the cost of production continues to soar, the dairyman finds it necessary to limit his activities to the keeping of only high producing cows. Nothing better shows the general recognition of the superior value of good stock than does the making of official records. Formerly many cattle were considered good merely because they had pedigrees or were of desirable conformation. The large amount of official testing, or advanced registry work, now being done and the premium placed upon those individuals of good type and pedigree that have proved beyond doubt that they are good producers, shows that the wide awake dairy farmer desires not only a well-bred animal of good appearance, but he must also have undisputed proof that she is a producer. When buying a horse or cow, while the purchaser might be willing to take the owner's word for all the good qualities of the animal in question, the majority of us would much rather be shown. The official record of a cow is as good as the record of a horse made on the track, because it has back of it the sworn statement of disinterested parties.

Advanced registry records, or official records, are records of the milk and butter production of dairy cows, made under the careful supervision of a representative of an agricultural college or experiment station, or by someone appointed by the breed association. Upon arriving at the farm, the first duty of the tester is to see the cows milked dry at the last regular milking period before the test begins. He must be present during each milking throughout the test, must weigh the milk from each cow at each milking, and take a sample of each cow's milk which he tests with the Babcock test. The Babcock tests are made in duplicate and variations between duplicates must not exceed two-tenths of one per cent. At the end of the test the results are tabulated on a special blank, the tester makes oath to the correctness of the work, the reports are signed by the Directors of the Experiment Station, and they are then forwarded to the breeders' organization of that particular breed. If the records meet the requirements set for cows of the breed, the cows under test are placed in the advanced registry or register of merit.

The requirements for entry varies with different breeds and also according to the age of the cows tested. The requirement of Jersey cows is twelve pounds butterfat in seven-day tests, or about fourteen pounds butter. The requirements for Jersey cows on yearly test vary from 250 pounds butter fat at two years, to 360 pounds at 5 years old at beginning of test. In making tests for seven days the tester is present throughout the test, but in year tests he is only present for two days during each month. The total yield for the month is calculated from the data secured during these two days

and from the milk record for the month which is kept by the owner of the cows. Bulls are also admitted after scoring 80% and having three daughters from three different dams in the advanced registry.

The term "Advanced Registry" is a rather mystical insignia attached to the name of a dairy animal. By the Jersey people it is called the "Register of Merit;" the Holstein breeders call it the "Advanced Registry Official," (abbreviated A. R. O.); and the Guernsey people call it simply the "Advanced Registry." But they are all virtually alike in having one common purpose, viz: to determine the possibilities of a cow's production at the pail and butter tub, or in foretelling the ability of a sire to reproduce in his offspring the traits that have made the females in his ancestry valuable. Prof. C. H. Eckles, of Missouri, says that "the Advanced Registry record is undoubtedly the most valuable factor in selecting a herd." It is like the pedigree in that it cannot guarantee to the animal in question an inheritance of the power to produce shown by its ancestors, but on the other hand it is an absolute guarantee that this animal stands a better chance of becoming a profitable producer than does the one about whose ancestry nothing is known. He who buys an advanced registry animal buys one upon which he can safely bank, but the man who buys one without a record is apt to take that which does not enrich himself but leaves the seller better off. He may draw a prize; he may buy another Jacoba Irene or a Colantha or a Dairymaid or a Banostine Belle De-Kol, but the chances are vastly greater that he will get just an ordinary nondescript cow.

A few definite illustrations furnish good evidence of the value of advanced registry records. A calf from one of the world's record cows was sold at a normal price before the record was made. As soon as the owner of the cow realized what she was doing he bought the calf back and sold him after the completion of the test for $8,000. What was the value of this official record to the owner? Again, the Jersey cow that holds the worlds record for three consecutive periods of lactation was bought for less than $200 before it was known what she could do, but her owner afterwards refused an offer of $10,000. An offer of $10,000 failed to get the champion Guernsey cow after her test and her calf could not be bought for any price. Can there be any question as to the value of these records?

To be sure these are striking examples of remarkable producers. There are not many practical dairy farmers who could hope to make such phenomenal records, yet profits in this line of work may be expected in proportion to the records made under official test. Not only is the value of a cow and her offspring greatly increased, but the low producers are eliminated from the herd, and hence the standard of production of the herd and the breed is constantly rising, which means more profit from a smaller number of cows.

The breeding of cows that have qualified for the advanced registry is a very interesting problem and one of vital interest to the breeder of dairy cattle. This question will be discussed in our next issue.

SILAGE FOR BEEF PRODUCTION

By K. A. NEELY, '13

Silage used to be considered a feed for dairy cattle only, but now it is being used more and more for feeding almost all farm animals. And especially is this true of beef cattle. It is already past the experimental stage in beef feeding and has to a large extent solved the problem as to how we may produce gains cheaply.

It furnishes the best means of storing the entire crop with the minimum waste and least room for storage. It requires 50 cubic feet to store one ton of silage while it requires about 400 cubic feet to store one ton of hay. Or compared on dry matter basis, it requires about three times as much room to store the same amount in hay as it does in silage.

Professor Henry in "Feeds and Feeding," has the following to say concerning silage: "Because of its succulence and palatability, this forage is recommended as a substitute for roots for fattening cattle." He further says: "If the stockman desires a cheap succulent feed for his cattle in the winter time, he will find it in corn silage. The same quantity of nutrients that a root crop yields can be produced more economically in corn forage stored in the shape of silage, and this article can be fed with satisfaction to steers during the early stages of fattening. At first as much as 40 to 50 pounds of silage may be given daily to each steer; when the full grain feeding period arrives, let the allowance be cut down to 25 or 30 pounds per day. A limited use of this feed will keep the system cool and the appetite vigorous."

Indiana Experiment Station reports the results of a six months' feeding trial, in which one lot was fed a ration of shelled corn, cotton seed meal and a full ration of corn silage. A second lot was fed a ration of shelled corn, cotton seed meal, some hay and about one-half a full ration of corn silage. A third lot was fed all the corn and clover they would eat. Hogs followed each lot. The net profit resulting from feeding the first lot, those receiving a full silage ration, shelled corn and cotton seed meal, was $24.04 per head. Those receiving a half ration of silage, shelled corn, cotton seed meal and some hay returned a net profit of $19.71 per steer. Those getting corn and clover only, returned a net profit of $12.64 per steer. This included the profits from the hogs following each lot.

Kansas Station says: "Steers fed a ration with silage made better gains, and excelled those without silage as prime beef."

Mr. Curtiss, of Iowa Experiment Station says: "Where good corn silage is used it may usually be substituted for about two-thirds the hay and about one-third the grain that would be used in full feeding, without the silage." Judging from these results the silo is a profitable investment for the beef producer. However, it should not be considered as a complete ration, it should be fed in connection with grain and roughage such as hay. It is a very common belief among feeders that silage-fed cattle drift more than dry fed cattle, but experiments do not show

a great deal of difference between them.

Silage seems, from experiments, to be an excellent feed for carrying cattle through the winter and finishing on grass the following summer. An agricultural publication has the following to say about feeding silage to stockers: "From results it appears that cattle receiving silage as their sole roughness during winter made the largest average gains; did not drift materially when turned on grass after the first ten days; slaughtered out to better advantage than dry-fed cattle, and were in a thriftier and better condition throughout the entire feeding period."

PECANS

By H. C. EVANS, Special

All that the name pecans suggests to most people is a small hard shelled small-meated nut which we buy at our groceries at twenty cents a pound. There is as much difference, however, between the hardshelled small nut and the first-class pecan as there is difference between the hickory nut and English walnut.

Nuts are among the most nutritious of all foods and because of the abundance of fatty matter in pecans it stands first among nuts. Cheese contains 35 per cent water, eggs 68.2 per cent, lean beef 75 per cent, bread 39 per cent, while pecans contain only 34 per cent, which goes to show the large amount of food in the small nut. The pecan has a higher fuel value than any other nut and also contains less water.

The pecan tree is indigenous to the United States and is a native of the Southern Mississippi valley. Still it is found growing wild as far north as Illinois and thrives when cultivated in many different soils. It belongs to the walnut family and its near relatives are the hickory, walnut and butternut. The scientific name Hicoria pecan is distinctly American as it is derived from powcohiccora and pecan, the two words the Indians gave to the hickorynut.

Its propogation may be carried on by seed or budding as grafted seedlings. Seedlings are so uncertain that unless time is no object the only way is to plant budded or grafted trees. It generally pays to buy one year old trees of standard varieties. So many fraudulent agents have sold pecan trees of poor varieties that people have become discouraged with the idea that pecans are worth planting.

The trees begin bearing in from four to six years and in ten years should bear paying crops. If, however, the trees are treated like a forest or grove they will probably never do any good. The land should be put in as good condition as for any other orchard. Some leguminous crop should be turned under and a good dressing of stable manure added. Throughout the growing season the ground should be cultivated frequently and as young trees need plenty of nitrogen, fertilizers high in nitrogen should be added. Later as the trees mature, more phosphoric acid and potash are required.

Many old trees that are not bearing profitable fruits may be made

very profitable by cutting over the top. Only a few branches should be cut and grafted or budded each year, but in the course of three or four years the old top can be entirely removed and replaced by a good variety.

Every farmer should have some pecan trees for shade trees even if he does not have a groove for they are beautiful, stately trees, very symmetrical and the branches commence high up the trunk. The roots do not bother the surface where the lawn mower runs and the nuts make a delicious article of food for the table. More and more the pecan is being planted in our cities and towns of the South and as the demand for nuts is increasing, the quality and quantity of nuts will also increase.

THE PRINCIPLES OF CROP ROTATION

By F. W. FLEMMING, '14.

Many farmers do not yet realize that a constant rotation of crops is necessary for the maintenance and upbuilding of the soil fertility. It is a well-known fact, however, that plants differ greatly in their food requirements and in their ability to add food to or procure it from the soil. When one crop is grown continuously on a piece of land the available plant food for that particular crop may become exhausted. It is the purpose of crop rotation to remedy this defect and many others that tend to lessen the productivity of the soil. This may be done by alternating legumes with non-legumes and deep-rooted plants with shallow rooted ones which not only prevents damaging the soil, but instead, is constantly increasing and preserving the soil fertility.

First, we will distinguish between legumes and non-legumes and their respective characteristics. The so-called leguminous plants consist of the clovers, beans, peas, etc., all of which go to make up the Leguminosae family. This family is best characterized by its ability to gather nitrogen from the air and deposit it in the soil through the medium of bacteria in the nodules on the roots. The non-legumes, however, are characterized by their absence of these root nodules. So the practicability of alternating legumes with non-legumes is to deposit nitrogen in the soil with legumes to supply the non-legumes. In this manner one plant feeds another and the soil does not suffer a very great loss.

It is surprising to know the effects of the rooting system of plants upon the improvement of soil conditions. Of course the shallow-rooted plants penetrate the soil but a few inches, whereas those with deep roots reach a depth of several feet; consequently, when the ground is plowed the long and oftentimes complex root system is cut off only a few inches under the ground, leaving the rest to decay, forming humus. And it is of great importance to remember that, after the decay of these fibrous roots, the subsoil is loosened up and the soil is left in much better condition for the preservation of moisture, by the many pores left from the decayed roots. It may also be noted that in the process of growth, the

deep rooted plants not only procure a certain amount of food material from great depths, but they may cause a portion of it to be deposited near the surface where it may be made available to the succeeding shallow rooted crops as they decay.

Another advantage of crop rotation though of lesser importance, is to control and eliminate diseases and insects that may become numerous and destructive where one crop is grown continuously. Most plant diseases are caused by bacteria which live on certain plants, and, if these plants are constantly grown on the same piece of ground the disease germs will have all chances to be carried over from year to year. But if a three or a four year rotation is practiced these short lived germs will in all probability die, having no host plant in which they are able to live. For the same reasons the injurious insects may also be destroyed.

The above theoretical reasons in favor of rotations are substantiated by experimental evidence. The Rothamsted Experiment Station carried on a four year rotation of turnips, barley, clover and wheat for 32 years and compared the yields of barley and wheat in the rotation with continuously grown barley and wheat under practically the same conditions. The following table shows the results:

	Bu. per acre	
	Barley	Wheat
Grown continuously....	18	12
In Rotation	32	26

This was a result of rotation solely, as there was no manure of any kind used. And, it merely goes to show that rotation increases the productivity of the soil.

Now, that we have thus enumerated a few of the advantages of crop rotation, it would be well to briefly summarize the few principles involved as regards their general application. In planning a rotation, the farmer must necessarily use his own judgment in regard to the soil condition, etc. But as a matter of fact he must ever keep in mind these few principles: In every rotation there should be one crop that necessitates frequent tillage. This is to keep down the growth of weeds and, to a certain extent, free the existing plant food. One leguminous crop—which is generally deep rooted—should also be included, so as to not only increase the nitrogen supply, but also to partially sub-soil the ground with the deep roots. In general, crops should be alternated that vary as much as possible in their food requirements, manner of growth, root system, and the time of year they are to occupy the ground.

RAISING THE CALF ON SKIM MILK

By J. M. REEVES, '15

One great mistake the dairymen of our state as well as those of others are making, especially where whole milk is sold, is in neglecting to raise their own dairy cows. They give as their excuse the expense. This becomes no small problem where milk is sold at eight to ten cents per quart, but it is not necessary to feed the calf on whole milk alone, since the

fat constituent may be replaced by grains, which are much cheaper and give about the same results.

Of course, we should not take every calf and try to make a valuable cow out of her, regardless of breeding, but those from the highest producing dams and best sires will naturally be the ones to select.

Every good dairyman sees in the heifer calf the possibility of a cow that will not only equal her mother, but may surpass her and raise the average of production of the entire herd.

The great cost of feed often causes him to dispose of the calf and thus many good dairy cows are slaughtered without a chance to prove their good qualities.

He then depends upon buying cows wherever he can get them to replace his herd. This not only keeps the average production of his herd down, but will even lower it unless he has a low producing one to start with.

Where does he make his money? Can he buy a high producing cow for a small amount? No, indeed! The man who knows his cow is above the ordinary is going to have an extraordinary price for her. Then is it cheaper to buy a cow to replace the herd, or raise her when but little whole milk is necessary?

Low producing cows, the kind which are usually for sale, not only fail to yield a profit, but do not pay for their keep.

It has been proven that a calf can be raised on skim milk nearly as well as being nursed by its mother.

The fact that many calves raised by hand are not as good as those nursed by the dam does not contradict the foregoing statement. The poor results are due to the methods of feeding, and not to removing the fat from the milk. Those fed by modern methods are practically the same in size, quality and value as those raised on whole milk. It is very necessary in feeding a calf that the utensils are clean and the milk about 100° F. as a sudden change will cause indigestion.

The calf when fed on skim milk may not be as fat as the one running with its mother, but when reaching maturity the difference will not be noticeable.

The following table was copied from the Kansas Experiment Station, Bulletin No. 126, showing the results of 3 lots of calves; one fed on skim milk, one on whole milk and the other nursed by its dam:

Experiment.	No. of calves	Days fed	Average gain per head	Daily gain per head	Cost per 100 lbs. gain
Skim milk	10	154	233	1.51	$2.26
Whole milk	10	154	287	1.86	7.06
Running with dam	22	140	248	1 77	4.41

Those nursed by dams and those fed on whole milk made a little better gain but at a much greater expense as shown by table.

All the steer calves were later put in a feed lot and fed for several months, at the end of which time the skim milk calves made the best gain; while the whole milk calves and those running with their dams made the least.

The calf should be taken from its mother when one or two days old and only in very exceptional cases should the separation be delayed more than eight, for the cow will fret more and the calf much more difficult to teach to drink. At first it should receive the mother's milk —not more than 8-10 pounds per

day. Many of the troubles in raising calves arise from over-feeding when young. When about two weeks old begin to substitute skim milk, a little at first but increasing until it entirely replaces the whole milk in ten days. The calf may now receive about fifteen pounds of skim milk—more with large and less with smaller calves.

When feeding skim milk, the fat removed by the separator must be replaced by that from another source. Sometimes commercial calf foods are used but these are expensive and no better than the home grown grains. It should be early taught to eat. In feeding grain, always feed dry after the calf has finished his milk ration. Iowa Experiment Station found the following grains to be best of any tried and valuable in this order: Cornmeal, cornmeal and flaxseed, oatmeal, and oilmeal. Kansas Station found shelled corn equally as good as the meal. Hay should always be fed. Don't feed all that the calf can eat but leave him a little hungry.

PROGRAM

OF EAST TENNESSEE FARMER'S CONVENTION AND INSTITUTE TO BE HELD AT KNOXVILLE, MAY 21, 22 and 23.

TEMPLE HALL

FIRST DAY, TUESDAY, MAY 21

Morning Session

10:00 Call to order by the President, John W. Cate, Cleveland.
Devotional exercises. Federation of Churches of Knoxville.
10:15 Address. Hon. T. F. Peck, Commissioner of Agriculture, Nashville.
11:00 The State Fair. W. R. Reeves, Jonesboro, and W. T. Roberts, Athens.
11:30 The National Conservation Exposition. E. H. Scharringhaus.
12:00 Appointment of committees.

Afternoon Session

1:00 How to get and maintain stands of alfalfa in East Tennessee. J. W. Fisher, Newport.
The rural community:
1:45 The school superintendent. Prof. J. W. Brister, State Superintendent of Public Instruction, Nashville.
2:30 The farm home. President Geo. A. Hubbell, Lincoln Memorial University, Cumberland Gap.
3:00 The woman of the farm home. Mrs. Charles O. Browder, Sweetwater.
3:30 The boy and the girl of the country home. *

Evening Session

7:00 Home economics (illustrated). Miss Catherine A. Mulligan, University of Tennessee, Knoxville.
7:45 Open discussion: How can farmers with no income except from the farm build up impoverished soils?

SECOND DAY, WEDNESDAY, MAY 22

Afternoon Session

1:00 Dedication of Temple Hall:
Invocation. Rev. Josiah Sibley, Knoxville.
Address. Dr. Andrew M. Soule, President Georgia State College of Agriculture, Athens, Ga.
Reception to Miss Mary Boyce Temple and guests.
4:00 Feed and seed control laws of Tennessee. A. L. Garrison, Chief Seed and Feed Inspector, Nashville.
4:45 Demonstration of live stock judging.

*To be supplied later.

Evening Session

7:00 Prevention and control of human diseases (illustrated). Dr. Olin West, State Board of Health, Nashville.

8:00 The silo: (1) Indispensable on modern farm; (2) Types of silo; (3) Crops for silo; (4) Feeding of silage. Discussion, led by J. N. Meroney, Darks Mill; and J. W. Hart, Athens, Ga.

THIRD DAY, THURSDAY, MAY 23

Afternoon Session

1:00 Reports of committees and election of officers.

1:15 Co-operation among farmers. L. M. Rhodes, President Farmers' Union, Huntingdon, and Hon. Oliver Wilson, Master National Grange, Peoria, Ill.

2:45 Adjournment.

GENERAL FARM AND LIVE STOCK SECTION

TEMPLE HALL

SECOND DAY, WEDNESDAY, MAY 22.

Morning Session

9:00 How the farmers may aid the State Live Stock Commissioner in the prevention and control of disease. Dr. Geo. R. White, State Live Stock Commissioner, Nashville.

9:45 Beef judging demonstration. Prof. C. A. Willson, University of Tennessee, Knoxville.

10:30 The farm silo. J. N. Meroney, Darks Mill.

11:15 Experiences of farmers of East Tennessee in crops for the silo and the value of silage. (5-minute talks).

THIRD DAY, THURSDAY, MAY 23

Morning Session

9:00 The equipment and management of a 200-acre stock farm. Prof. Milton P. Jarnagin, State College of Agriculture, Athens, Ga.
Discussion.

10:00 Draft horses for Tennessee. D. S. Combs, Hickory Valley.

10:30 Demonstration of the points of merit in draft horses. Dr. M. Jacob, Knoxville.

11:00 Winter and spring pastures for sheep. J. E. Hite, Gallatin.

11:30 Pastures and crops that assist in marketing hogs from the field. Dr. J. F. Stanbery, Newport.

DAIRY SECTION.

IMPLEMENT BUILDING, EXPERIMENT STATION FARM

SECOND DAY, WEDNESDAY, MAY 22.

Morning Session

9:00 Some reasons why dairying is not more nearly universal in East Tennessee. R. M. Murphy, Fountain City.

9:45 The equipment and management of a dairy farm of 200 acres or less. J. H. Bradshaw, Knoxville.

10:30 Experience in breeding dairy cattle. Discussion, led by J. H. McClain, Dairy Division, U. S. Bureau of Animal Industry, Washington, D. C.

THIRD DAY, THURSDAY, MAY 23

Morning Session

9:00 The crops to plant to insure green feed the year round. Prof. H. A. Morgan, Director Experiment Station, Knoxville.

9:45 The selection of a dairy cow (demonstrated). Prof. C. A. Willson, University of Tennessee, Knoxville.

10:30 Experiences in other states helpful to dairymen in Tennessee. J. H. McClain.

11:30 Selection of next year's presiding officers.

HORTICULTURAL SECTION
ROOM 205 MORRILL HALL

SECOND DAY, WEDNESDAY, MAY 22

Morning Session

9:00 The farm garden: How to have fresh vegetables throughout the year. A H. Dailey, Knoxville.
The Irish potato:
9:30 The potato on the Cumberland Plateau. J. E. Converse, Crossville.
9:45 The potato in upper East Tennessee. D. J. Farthing, Butler.
10:00 Two crops of potatoes a year. *
10:15 Beans the summer through. *
11:00 The earliest strawberries on the market. *
11:15 The plan of the farm. A. S. Adsmond, Knoxville.
11:30 Co-operation in trucking. Charles R. Coleman, Knoxville.

THIRD DAY, THURSDAY, MAY 23

Afternoon Session

9:00 Peach experiences. *
9:30 Grapes for the amateur grower. Frank McClung, Knoxville.
10:00 The making of an orchard. Prof. C. A. Keffer, University of Tennessee, Knoxville.
10:45 Demonstration of spraying machinery. Prof. G. M. Bentley, University of Tennessee, Knoxville.
11:30 Japanese persimmons. *

POULTRY SECTION
SECOND FLOOR OF BARN NO. 1

SECOND DAY, WEDNESDAY, MAY 22

Morning Session

9:00 Poultry interests of Tennessee and the South. Jas. B. Dismukes, Knoxville.
9:45 Feed and care of the hen for winter egg production. W. M. Landess, Fayetteville.
10:30 Methods of preventing loss in the marketing of poultry and eggs. H. C. Pierce, Nashville.
11:15 Discussion.

THIRD DAY, THURSDAY, MAY 23

Morning Session

9:00 Methods of feeding and care of chickens from hatching to maturity. W. M. Landess, Fayetteville.
9:45 Discussion of the most prevalent poultry diseases on the farm. Dr. M. Jacob, Knoxville.
10:30 General discussion of various subjects relating to farm poultry. Led by J. A. Dinwiddie, New Market.

HOME-MAKING SECTION

FIRST DAY, TUESDAY, MAY 21

Morning Session, 9:00 o'clock

(See general program)

Afternoon Session

TENNESSEE HALL, 720 WEST MAIN AVE.

2:00 Address. Mrs. James A. Reagan, Sweetwater.
3:00 Household conveniences. Mrs. J. Taylor Stratton, Madison.
4:00 Demonstration of cake making.
(A question box will be prepared, and some time during the session a discussion of questions relating to the home problems will be held.)

SECOND DAY, WEDNESDAY, MAY 22

Morning Session

MORRILL HALL, UNIVERSITY CAMPUS

9:00 Girls' Tomato Club, and rural school improvement. Miss Virginia P. Moore, Nashville.
9:45 The kitchen garden. Prof. C. A. Keffer, University of Tennessee.
10:30 Women of other lands (with stereopticon views). Mrs. Charles A. Perkins, Knoxville.
11:15 Business session.

THIRD DAY, THURSDAY, MAY 23

Morning Session

TENNESSEE HALL, 720 WEST MAIN AVE.

9:00 The moral training of children. Miss Bessie Love, Sweetwater.
10:00 First aid to the housewife. Miss Catharine A. Mulligan, University of Tennessee, Knoxville.
11:00 Exhibit of labor-saving devices and of the work done in the Home Economics Department of the University.

CORN CLUB SECTION

In charge of C. F. Stripling, District Agent.

SECOND FLOOR OF BARN NO. 1

FIRST DAY, TUESDAY, MAY 21

Afternoon Session

1:00 Address. Prof. O. B. Martin, Asst. in charge Boys' Corn Club Work, U. S. Department of Agriculture, Washington, D. C.
2:00 Influence of tillage on yield of corn. H. D. Tate, State Agent, Jackson, Tenn.
2:30 How to select your ten best ears. J. C. Pridmore, University of Tennessee.
3:00 Score card judging of corn by the boys.
3:30 Visit around Experiment Station Farm.

BUILDING SILOS

By N. F. HANSON, Special

In these days of high cost of feed and the increased number of live stock it becomes necessary for the farmer to plan ahead how he is to provide food for his live stock through the winter. The silo is about the best means of providing winter feed. Silos are becoming very popular and in a few years every up-to-date farm will have one or more of them. They are not very expensive and are comparatively easy to build. Many kinds of silos are used in this country. The wooden silo is the more popular, although there are many made of stone, concrete or brick.

The form of the wood silos can be either rectangular, square, octagon or round. The most economical of these is ordinarily the round form, because there is less wall space, and lighter material can be used in its construction. More round silos have been built in the last few years in this country than of all other kinds combined, and this type of silo will doubtless be the most popular in the future.

In the building of wood silos there should be a firm foundation for all forms, and the woodwork should be at least twelve inches above ground to prevent decay. For a round silo 30 feet deep the foundation wall should be about a foot thick. The sill may be made of single 2 x 4 pieces cut into two-foot lengths, with the ends beveled so that they may be toe-nailed together to form a circle. The studding need not be larger than 2 x 4's but should be set as close as one foot apart. On the side where the doors are to be placed the studding should be double. The doors are usually made about two feet wide and from two and one-half to three feet high and placed one above the other at suitable distances.

Sheeting and siding will vary according to the size of the silo and other conditions. In a silo larger than eighteen feet in diameter, there should be a layer of half-inch sheeting outside, under the siding. In applying the sheeting, begin at the bot-

tom and go up. When the last sheeting is up, 2 x 4's cut in two-foot lengths should be spiked on the top of the studs. In the making of the lining, two important things should be kept in mind: the lining should be airtight and remain so, and it should be reasonably permanent, when paper is used, care should be taken to select a quality that will not decay and it should be both acid and water proof. Great care should be taken to have the two layers of boards break joints at their centers and the paper should lap from eight to twelve inches. The first layer of lining should be put on with 8-penny nails and the second layer with 10-penny nails, the object being to draw the boards as closely together as possible.

The silo roof is generally made by spiking together two layers of two-inch stuff, cut in the form of a circle. Shingles are also used and make an excellent roof, although no roof is needed except as a matter of convenience when throwing out feed in rainy weather.

In painting the inside of the silo, it is best to use some antiseptic as there is no paint that will ever become saturated with the silage juices. About the best treatment of the lining is to give it a coating of coal tar. It is important to provide ventilation for the spaces between the studs, as well as for the roof and the inside of the silo. Between each pair of studs a one-inch auger hole is bored through the siding and sheeting at the top, so that there will be space enough left between the edge of the siding and sheeting and the sill for air to enter.

About the cheapest kind of silo that can be built is the stone silo. For a stone silo 30 feet deep and 16 feet in diameter, built on the inside of a barn, the cost can be lower than $100. This cost depends, however, upon the kind of lumber used and the price of labor. A brick or concrete floor is necessary and from it a wall should extend a few inches. The lumber consists of pieces of studding 2 x 4, 14 and 16 feet long, flooring for doors and tongued and grooved staves. When studding is not used ⅝-inch round iron hoops are necessary.

Brick, concrete, and stone silos are used in some parts of the country but to a slight extent. On account of the high cost of construction they are impracticable for the ordinary farmer.

All silos should be as nearly air tight around the walls as possible and smooth to allow the silage to settle compactly to exclude the air and prevent rotting. Also if not covered they should be provided with a drain at the bottom. Silos may be built about two feet into the ground but never deeper than four. The diameter of the silos should be proportional to the number of cows fed.

Editor's Note: Descriptions of various silos and detailed plans for their construction may be found in a number of Farmers' Bulletins, which may be obtained by application to your Senator or Representative in Congress, also Circular 136 of the Bureau of Animal Industry, Washington. The following states have good bulletins: Missouri, Virginia, Iowa, West Virginia, Wisconsin and Michigan. The Silver Mfg. Co., Salem, Ohio, gives a very good detailed description of several kinds of silos.

THE U. T. FARMER

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Published Monthly by the Agricultural Club of the University of Tennessee.

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EDITORIAL.

The May number marks the beginning of a new year for the U. T. Farmer. It is in this number that the new staff places its maiden attempts before the people.

A review of the past history of this paper shows no year more successful than the past, financially and otherwise. Under the careful direction and the energy of the retiring editor and business manager, the paper has maintained a very high standard of excellence. The variety of subjects and their treatment reflect much credit upon the whole Agricultural College.

It is with the feeling that a sacred trust has been laid upon us that we take up the task of keeping the U. T. Farmer at its present enviable position. We shall always strive to make it better since we believe this to be the only way to keep it as good. How well we succeed will depend largely on the support given by each student of the Agricultural College. It is not too much to say that the prospects for the coming year are the brightest we have ever had. The "Fish" class is the largest of any on record and the faculty say, among the most industrious.

Banostine Belle De Kol has just completed a year's record of 1,058 pounds of butterfat! This is the greatest record of any cow in the world. This wonderful cow made this record under the care of the Ohio State University. She is only five years old and gave 27,404 pounds of milk which tested 3.86% butterfat making 1,058 pounds of butterfat or 1,322.9 pounds of butter.

All Agricultural Alumni are requested to take especial notice of the fact that we now have an Alumni editor anxious to hear from each alumnus. Let us hear from you so that we may know where you are and what you are doing.

The Volunteer Union is making arrangements for Alumni Day during Commencement week. It would be a very fine thing to have all of

our old men back with us at one time. It is hoped that each Agricultural alumnus will strive to be present on this occasion.

The farmers will be here this month, yes, thousands of them, to tend the 39th annual meeting of the East Tennessee Farmers' Convention. What event in the whole collegiate year brings together so many enthusiastic people for a few days? This is a great event for the whole University. "Engineers" and "Lits" as well as "Ags" look forward to these three days. The inspiration and instruction obtained here are of inestimable value to all whom it reaches and this is expected to be the banner year. The various departments have been added to until now each member of the family will find something of especial and particular interest.

The new stock judging pavilion and auditorium in O. P. Temple Hall, erected by East Tennessee Farmers' Convention will be ready for use. This is an appropriate and substantial gift from the convention to the cause of agricultural education.

"Of all the executive departments there is no other, not even the post-office, which comes into more direct and beneficial contact with the daily life of the people than the Department of Agriculture, and none whose yield of practical benefits is greater in proportion to the public money expended."—Roosevelt.

This is a pretty positive statement, but the Department has done a wonderful work in instigating research, in correlating results scientifically, and in disseminating throughout the nation, the principles of increased production.

It must hereafter deal with men. One of the most important aims in the future must be to foster agriculture for its social results. There must be developed conditions which will tend toward the production of the best kind of men. "The problem of production has not ceased to be fundamental, but it is no longer final; just as learning to read and write and cipher are fundamental, but are no longer the final ends of education."

In the future much more attention will be directed toward the improvement of the social side of rural life. The drift toward the city is largely due to its superior social opportunities and the greater vividness of life there. The problem is, how to make rural life more attractive to the young people. We must look to better high schools, to the church and to the organization of all kinds of real live community organizations. Of course, we must learn how to produce the best crops if we wish to continue a successful nation, but of even greater importance, we must learn to raise the best crops of boys and girls.

One event of interest to everyone, in any way connected with the University is that of the road building of the Engineering Department. On Tuesday, April 9th, the Engineering students completed a drive running from the bridge where Main Street crosses the creek, around the "Hill" to Estabrook Hall. Funds were provided by the Engineering Alumni and two beautiful gate posts of Tennessee marble were erected at the entrance.

PERSONAL MENTION.

Doctor Ayres, Professor Morgan and Professor Essary spent the 3rd, 4th and 5th of April in attending the Southern Educational Association at Nashville.

On Saturday, April 6th, there was held at Nashville the first regular meeting of the Tennessee Academy of Science. A number of the faculty was present; Dr. C. H. Gordon, professor of geology, being chosen president, and Doctor Reynolds, department of botany, chosen editor. In addition, the following were present: Doctor Ayres, Doctor Ogden, Professor Bain and Doctor Schaeffer.

Professor Morgan spent several days in Nashville attending the Southern Commercial Congress which was held the week beginning April 8th.

Doctor Schurman, president of Cornell University, spent March 24th and 25th on the "Hill," and delivered an excellent talk in chapel.

Mr. C. H. Lane, '09, now assistant in agricultural education at Washington, spent April 5th at the "Hill" and Experiment farm.

Mr. A. S. Adsmond went to Oliver Springs, April 23rd, to superintend the planting of an orchard for a large corporation there.

Mr. B. H. Rawl, chief of the Dairy Division, Bureau of Animal Industry, visited the University and the Experiment Station, April 8th.

Prof. J. C. Pridmore lectured at Tyner High School, April 12th.

Mr. F. S. Harkleroad was called to his home at Bristol, Tenn., for a few days by the death of his uncle, Mr. A. C. Harkleroad.

Mr. H. B. Derr, office of Grain Investigation, Bureau of Plant Industry, gave a brief talk on how the department is seeking for grains and cereals best suited to the South, April 12th.

Dr. A. C. True, Director of Office of Experiment Stations, was the guest of Professor Morgan, April 12th and 13th. He gave an exceedingly interesting sketch of the developments of Agricultural Education. He was heard with pleasure by the Ag. boys and the D. S. girls.

Mr. R. M. Murphy, '10, was on the Hill, April 13th, returning home from the University of Georgia.

Mr. C. A. Hutton spent April 11th to 15th at the farm of Mr. P. Whitaker and son, Columbia, testing cows for advanced registry.

Mr. L. R. Neal, visited the University, April 16th.

Professor Keffer accompanied by J. C. McAmis, Judd Brooks, R. R. Blake, A. S. Adsmond and W. K. Tipton, were at Cranberry, N. C., April 17th to 20th, laying out an orchard for the Cranberry Iron Co,

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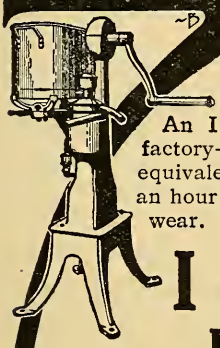

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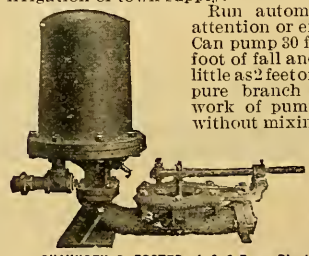

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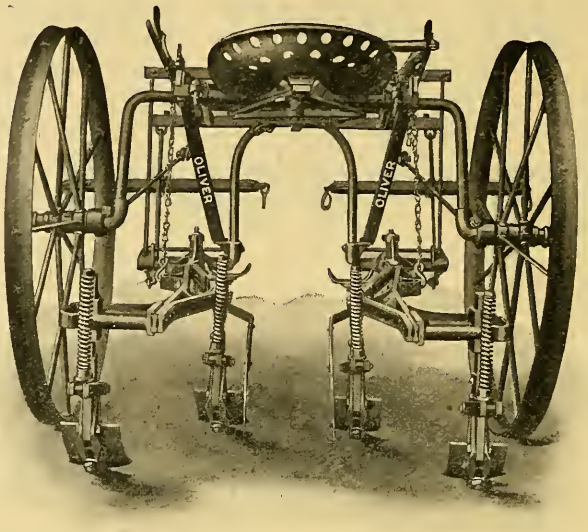

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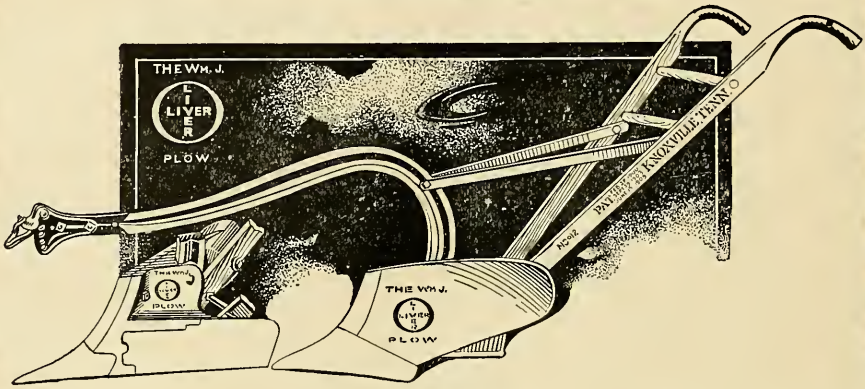

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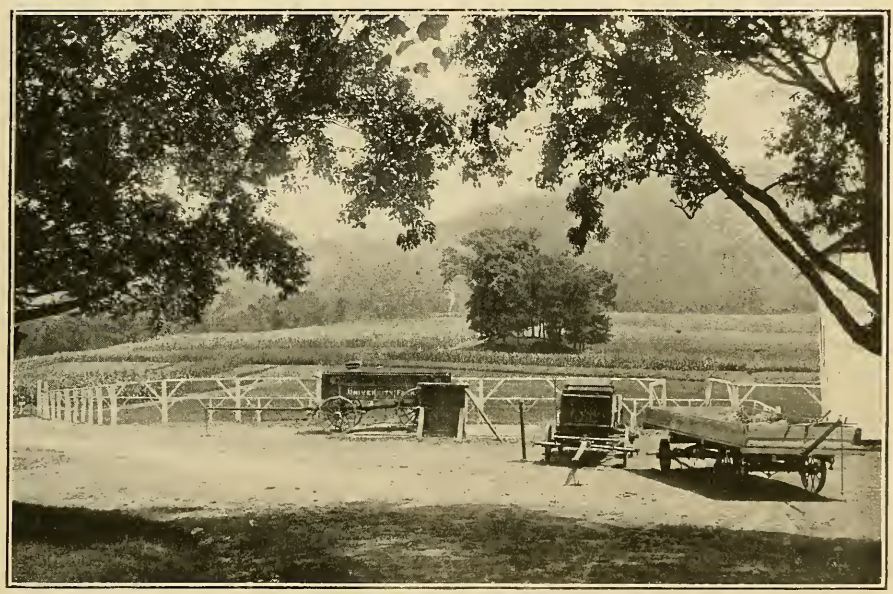

ON THE STATION FARM.

Vol. VI. JUNE, 1912 No. 9

Published Monthly by

THE AGRICULTURAL CLUB

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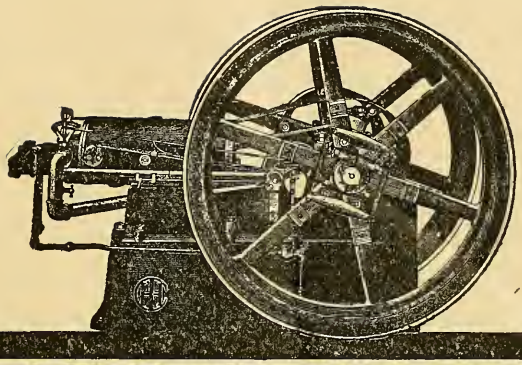

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THE U. T. FARMER

Vol. 6. JUNE, 1912. No. 9

GREEN MANURING.

By ALFRED L. RUBIN, '14.

Green manuring is the plowing under of green crops for the purpose of improving the texture of the soil and to increase the supply of available plant food. The crops for green-manuring can be grown between the harvesting of one crop and the planting of another and there is probably no better and more economical way of changing the unavailable plant food into more available forms.

The effect of green-manuring varies according to the original character of the soil, for example: sandy or gravelly soils are made darker in color which increases their efficiency to absorb the sun's rays, thereby raising the temperature. Another effect is that it makes it more retentive of moisture. The clay soils are made more porous, less likely to puddle and bake, and less subject to washing. The effect on loamy soils is not so noticeable.

The most important result of green-manuring is the addition of humus. Other things being equal the best green-manure crop is the one that will furnish the largest amount of material which will readily decay in the soil to form humus.

There are, however, additional ways in which such a crop may be beneficial. Deep rooted plants are decidedly preferable to shallow-rooted ones because they penetrate into the subsoil and bring up food elements that can be used by the shallow-rooted plant. They also make it possible for air and water to find entrance to the subsoil, especially after the roots decay. Therefore in a way every deep-rooted plant is a subsoiler.

Leguminous plants such as peas, beans, clover and alfalfa, are more valuable for green manuring than the non-legumes, which includes wheat, oats, rye, barley, etc., because they not only provide humus but also have the ability to obtain nitrogen from the air which upon decaying is added to the soil. For this reason, green-manuring crops should be legumes if the soil is in proper condition to grow them. Some lands will not grow legumes because of the fact that they are either lacking in fertility or need inoculation or probably both. Inoculation is very easily accomplished by simply sowing about two hundred pounds of soil per acre taken from land where a legume was previously grown. If lacking in fertility a very poor soil can be brought up to high-producing-power by starting with rye which will grow fairly well on most any soil, fertilizing it heavily to incourage a large growth. Then

after the soil has been properly prepared, the legume can be planted.

The time for plowing in the crop and the proper condition of the soil should receive some consideration. As a rule, there is danger of injury to light soils in plowing in a heavy crop of green material, particularly, in dry weather. For example, rye makes a rapid early development and if allowed to mature, it not only draws heavily upon the available plant food of the surface soil, but often exhausts it completely of moisture. Therefore if plowed down in its mature state it will result in leaving between the surface and the subsoil a mass of vegetable matter not readily broken down, thus cutting off the connection between the surface and the reservoir of water lying below. Should dry weather follow, the decay will be slow and as the moisture and plant food that is contained in the surface soil have been extracted by the rye crop, the effect on the following crop is sure to be bad. The bad results following the plowing under of large crops is more likely to be due to this excessive drying than to souring of the soil although souring may result in cold, wet, heavy soils. As a general rule, however, the crop is mature, the weather in a favorable condition, and the soil containing plenty of moisture and warmth, the vegetable matter will decay fast enough so that there will be no bad results produced by green-manure.

If the proper care and forethought is taken with reference to both the plowing in of the green crop and inoculation of the soil, there is no question as to the advantages that may be derived from the practice. It will result not only in the building up of soils poor in nitrogen but will contribute materially to the improvement of their physical character, their water-holding capacity and their consequent crop-producing power.

SAVING THE CLOVER CROP.

By THOS. L. ROBINSON, Special.

The actual worth of clover hay is measured by its feeding value since a large percentage of it is fed on the farm. Its feeding value depends upon cutting at the right time, and curing and storing without damage from dews, rains or excessive sunshine.

The proper time to cut clover is, of course, when the largest quantity of the best quality of hay can be secured. This is about the time the first heads begin to turn brown. If cut sooner, the curing is tedious; if cut later, the stalks lose in palatability because as ripening proceeds, the protein and other nutrients travel from the leaves and stems to the seed where they are stored. The stems not only become less nutritious but lose many of their leaves and heads by slattering because they are so brittle when dried. Then again the nutrients that are stored in the seeds are of little value from a feeding standpoint, since they pass through the digestive tract of the animal without being digested.

Clover hay is more difficult to cure than timothy or the other

grasses, because: (1) the weather conditions at the time for cutting the first crop are often unfavorable, (2) the plant is so succulent, containing more water than many other hay crops, (3) when placed in piles it does not shed the rains as readily as the grass hays, and (4) the leaflets and flowerheads are more easily broken off in handling than are the leaf blades and spikelets of grasses. Moreover, clover hay is more likely to become dusty when rained upon than is the case with the grasses.

The curing of clover hay is really a process of driving off the surplus moisture in order to prevent moulding or decay of the crop. Green clover has from 70 to 75 per cent of water while the hay ready to stack contains only from 20 to 25 per cent. The best methods to cure the hay depend upon weather conditions and the size of the crop. Hay exposed to rains or excessive sunshine is greatly injured in quality and depreciated in feeding value, because it becomes discolored and loses, by leaching or by evaporation, certain volatile oils which give the desirable aroma and render it palatable. The aim should be, therefore, to cure hay to as great an extent as possible by the aid of the wind rather than by the sun.

In view of this fact many growers prefer to mow in the afternoon after the intense heat of the day is over. This gives an opportunity for the rapid evaporation of water through the leaves before the withering sun of the following day shrinks the leaves.

Clover like any other plant evaporates water, principally, through its leaves and hence the longer the structure of the leaves is kept intact the more rapid will be the curing of the hay. As soon as the leaf surface is destroyed or dried up, the bulk of the water must pass out the stems and this is a very slow process.

On the morning following, if the crop is not too heavy and weather is fair, the rake should be started in time to get all the previous evening's mowing raked into small windrows by noon. The rake should not be started too soon, however, since clover that is not sufficiently dry will not rake up clean and there is much more draught on the rake and more difficulty in dumping.

The crop should be put in small cocks by the second night after mowing. Small cocks of say 100 pounds of cured hay are desirable as they cure quickly. If the weather looks unfavorable, the loose hay should be scraped off with the inverted fork as this helps in the shedding of rain. Another method that works exceedingly well is to cure in little stacks on small racks. By this method the crop can be gotten out of danger from rains quicker than by any other but it is more work and is not necessary save in very bad weather. Occasionally, hay should be left in the cocks for as much as two days to sweat but usually less time is required; if cured on racks more time is usually necessary. When a wisp of the hay can be twisted and no liquid seen, it is ready to stack or store in the barn.

Other things being equal, the less the hay is handled, the better will be the quality of the hay as each

movement results in the loss of the fines and more nutritious part. The important thing to remember in curing clover, alfalfa, or other legume hay is to prevent the leaves from becoming brittle and breaking off, since they contain the bulk of the nutrients as well as a large percentage of the volatile oils, which give to hay its pleasant taste and aroma.

A RURAL NEED.

By H. P. OGDEN, '13.

The unexampled prosperity of our nation rests upon two cornerstones: on the one hand, the production of raw material; and on the other, its manufacture and distribution. The production of the raw material is the province of agriculture, the task of the farmer; its manufacture into useful products and the distribution of these, the province of commerce and labor, the task of the city man.

The nature of these tasks is obviously quite different and the dwellers of one sphere cannot be expected to appreciate all the problems that confront the workers in the other, except in a general way. Each, however, has an interest in seeing the problems of the other successfully solved, not only as a matter of general interest but one of vital importance because on the correct solution of these problems depends the comfort if not the existence of the whole nation.

There are only two ways to increase food production; one by increasing land areas tilled, and the other by increasing the digestible nutrients produced per acre. The history of our country reveals the most marvelous growth in production that the world has ever witnessed. The pioneer's axe is immediately followed by the plow. When yields in one place declined larger areas of new land were called into requisition. As long as new lands were available we astounded the nations with our growth in wealth and influence. But our new lands are now under cultivation and old methods of farming have been of such a nature that our older soils are already becoming non-productive. Since we have no more new land to cultivate, we must turn to the other alternative that is to increase production per acre.

This state of affairs became apparent some years ago and the Department of Agriculture was established with the hope of solving the question. The growth and influence of this department is hardly conceivable. Roosevelt says, "Of all the Executive Departments there is no other, not even the Post Office, which comes into more direct and beneficent contact with the daily life of the people than the Department of Agriculture, and none whose yield of practical benefits is greater in proportion to money expended."

The Department has done wonders. It has shown the farmer how to grow two bushels of corn where one grew before. It has so successfully grappled with diseases among domestic animals that today it leads the world in the dispatch with which it eradicates contageous diseases among live stock. It has made experiments, correlated results scientifically, and so disseminated the

knowledge thus acquired that today we lead the world as an agricultural country. A short time ago the Ohio Experiment Station completed a record breaking milk test, with Banostine Belle DeKol, the five year old Holstein cow that produced 1245 pounds of butter in one year. This problem of production is rapidly being solved even when new lands are not in sight.

Yes, this question of production is rapidly being solved by modern scientific methods of investigation and the indications are such as to give one the feeling that this country will solve the hitherto unsolved problem of how to produce a sufficiency of raw materials for home consumption. To be sure, there are many vexing problems confronting us, problems calling for the brain and brawn of every farmer and agricultural investigator, but their solution seems to be assured to a great extent. But we, the people of the soil, have another problem, one as vitally necessary of solution as that of food production, a problem upon whose satisfactory solution must rest in no small measure the prosperity and social permanency, and influence of this great nation.

I refer to the need of improvement in the social conditions of rural life. The ethical needs of the people of the country must be considered as well as their physical needs. We must have social and intellectual opportunities in addition to physical comforts. It is granted that before we can have great intellectual and ethical advances we must have prosperity, but in many places the problem has already changed from a question of prosperity to one of attractiveness, and it is no longer merely a question of corn and wheat and cattle but one of moral, intellectual and social improvements.

Before great advances are made, the life of the country must be made more attractive to the young people and to the women. The drudgery and irksomeness of rural life and its social stagnation are driving many of the best boys and girls to the cities, where hours of labor are shorter and where greater social opportunities are to be enjoyed. The vividness and movement of the life throws an irresistable glamour over the city which the more ambitious young people find it very difficult to overcome. There are also thousands of city men—country bred—longing to return to the country but are prevented by wishes of their women folks who dread the lonesome hours of hard work that too often falls to the lot of the farmers wife.

Who is to say how farm life is to be made less solitary and fuller of opportunities for those of especial ability? How can the load be lightened from shoulders too delicate to carry it or the weary heart be gladdened or the ambitious spirit satisfied? How can a compelling desire be engendered in the hearts and souls of all to keep the rural home and neighborhood on the highest plane of morality, love and patriotism?

On the farm, in the farm home and the immediate neighborhood are formed many of the traits of character in the boys and girls which will determine the future character of the man or woman. Nearly one-half of all the children in the United States are born and brought up in

the country. Here oft alone the farm boy has leisure to think and dream and build his air castles. He is continually beset with little difficulties and problems which he works out by his own efforts and which make him stronger for the later battles of life which will call for all his self-reliance and patience. If coupled with all the natural advantages for self-education and character building he is brought up in an atmosphere of high ideals, he should develop into a man well fitted to cope with the problems and temptations of life whether he remain in the country or go to the city.

These conditions are not utopian or so difficult of attainment. In many communities such conditions exist already and are great factors in the production of great minds. But on the other hand there are thousands where home life is obscured; where education is neglected; where the church is losing its influence or has never had any; and where the social life is dead or worse. Such sad examples of indifference or ignorance exist in all parts of our country.

Is it any wonder that rural life has no greater attraction for those possessing inherent intellectual ability? Should the boys and girls be blamed for leaving when they have never had disclosed to them the financial possibilities of farming; when they have never had a glimpse into the laws of nature which would put them in sympathy with her processes; and when they little dream of the comforts of rural life and the possibilities for intellectual development and culture. Our systems of education have lead them away from the farm; our rural home life has too often failed to instill a deep and abiding desire to know nature and her laws; and our society has failed to supply those things which bind us closer to our neighbors and develop characters.

When these deficiencies are remedied or improved we need have little fear of the boys and girls leaving the farm. To be sure many will leave and will find their life work in the cities but they will be stronger, wiser and better citizens for the cities because of their early life in a progressive rural community.

THE EFFECT OF INBREEDING UPON VIGOR.

By J. CARL McAMIS, '12.

Like many other phases of the question of heredity, knowledge concerning the effect of inbreeding upon the offspring is in an unscientific and indefinite state. The term inbreeding is sometimes applied in nonsexual reproduction, to vegetative propogation in plants, and to parthenogenesis and self fertilization in lower animals. It is more commonly used with species of separate sexes to mean the union between brothers and sisters and between parent and offspring.

There has long been a tradition among breeders and people in general that inbreeding or even close breeding was not desirable. Laws were recognized among the barbaric tribes against incestuous marriages. The idea has been handed down almost unchanged to the present time.

This is shown by the following quotation from Charles Darwin. "The consequences of close enterbreeding carried on for too long a time are as is generally believed, a loss of size, constitutional vigor and fertility, some times accompanied by a tendency to malformation. On the other hand the benefit from across even when there has not been any very close interbreeding, is almost unvariably at once conspicuous."

Experimental data is not lacking to show that deterioration takes place slowly where inbreeding is practiced.

In laboratory experiments a German investigator named Bos bred a family of rats through thirty generations extending over a period of six years without the introduction of newblood. Offspring were bred to their parents and brothers to sisters. He reported a marked decreased in size and fertility. Castle inbred the pomace fly for 59 generations and came to the same conclusions. Probably the most classical experiments have been carried on by Weismann in which he inbred 29 generations of mice and found clear evidence of diminishing vigor and fertility. It is interesting to note also that breeding brother to sister gave more disastrous results in every case than breeding parent to offspring.

Frequently, attempts have been made to explain the reduced fecundity of the most improved breeds of live stock on the grounds that they have closely unbred. The Poland China hog has been sighted as a notable example.

Many scientist hold that it is necessary to the life of the cell protoplasm that it receive infusions of unrelated material at certain intervals. Some have held that inbreeding is an unnatural and abnormal process. Mr. Cook of the Bureau of plant Industry says, "If we recognize broad breeding as the natural process in which organisms thrive and species make evolutionary progress, it is easy to understand that persistent narrow breeding may interfere with such progress or cause degeneration in character and qualities already attained. Evolution instead of being brought about by restriction of descent as some have supposed is actually hindered and is finally undone." Others site as proof of this theory the fact that in nature many plants are adopted to prevent self-fertilization and wherever cross polenation takes place increased vigor results.

After summing up the evidence against the practice of inbreeding we find that as yet there is no physiological reason why it should cause a decrease of vigor. For practically every experiment and reason against it there has been an experiment taking the opposite view. If it is true that inbreeding contains such possibilities of evil as have been attributed to it, what then is the justification of the practice in the past in the breeding of our choicest animals? What then of the fact that the most famous sires for vigor and constitution in every breed have been strongly inbred? We hear much of natures provisions for preventing inbreeding but little of the many species that are self-fertilized. The wheat plant is self-fertilizing to the closest possible degree and it is perhaps the most vigorous prolific, and all around cosmopolitan success

among our domestic plants. In the experiments given against inbreeding, the organisms were not under natural conditions and there is no proof that the loss of vigor was not due to the environment. Besides it has been shown just as conclusively by experiment that by selection, both vigor and productiveness may be maintained and even increased while inbreeding.

Therefore we must conclude that inbreeding is not necessarily the cause of a lack of vigor and low fertility but that it may be accompanied by exceedingly disastrous results. We must conclude that the same laws of heredity are at work in inbreeding that are at work in broad breeding, like begets like in both cases.

The practice is either very good or very bad depending upon the quality and fitness of the animals to be mated. It intensifies characters, increasing their prospects from possibility to probability and then to a certainty. It affects all characters of the individuals alike; bad as well as the good ones. So far as practical breeding operations have shown, and herein lies the only disadvantage of inbreeding, it intensifies the undesirable characters as well as desirable ones, and for this reason it has been followed by the most striking successes and most marked disasters.

If it is true then that a loss of vigor follows inbreeding, it is because the loss of vigor and the lack of fertility are among the most common defects of animals and also because these defects were present before inbreeding and were really intensified rather than caused by it.

It is a rigid test of a race to be inbred. If a defective character is present it is likely to show itself. It should only be used when the individuality of the animals is known and when they possess only strong characters which it is desired to intensify and it is the most powerful method known for accomplishing this end.

Another advantage of this method of breeding when wisely practiced is to purify the herd for definite characters. The result of such purification is prepotency and informity of type, because it brings to light the recessive characters so that they may be eliminated and it narrows the source of hereditary material which must result in informity.

In the light of experience of practical breeders and the excellent results which they have obtained, as well as laboratory experiments to prove their results and because of a lack of sufficient experimental data and physiological reasons to disprove them. I am forced to the opinion that inbreeding will not destroy vigor but rather it may be used to intensify that character provided the animals possess no weakness which will result in a loss of vigor and also provided the breeder practices vigorous selection of both parents from most vigorous families. But these provisions cannot be emphasized too strongly.

ADVANCED REGISTRY RECORDS IN THE SELECTION OF BREEDING STOCK.

By C. A. HUTTON, '13.

The various breed associations have done a great service to the live stock industry of this country. They furnish one of the best examples we have of successful co-operation among farmers and breeders. But for a long time their chief work consisted in the keeping of lineal pedigrees. Without underestimating the importance and necessity of this line of work the various breed associations are now placing more and more emphasis on the value of performance along with lineal pedigree. This fact is well exemplified by the work of the different dairy breed associations, for instance, in the Advanced Registry work. All of the dairy breed associations now maintain separate books for the registration of the performance of their animals.

Recognizing then the value and importance of performance and of Advanced Registry work, the vital question confronting the breeder is, how have the existing Advanced Registry cows been bred? If he possesses sufficient knowledge on this point he can then breed others like them. The American Breeders' Magazine recently published an article giving the breeding of a large number of Advanced Registry cows and bulls. This article is largely a review of the date there presented, and the tables here printed were taken directly from that magazine.

It is obvious that all the animals entered in the Advanced Registry for the first few years were of necessity from animals not in the Registry. The American Jersey Cattle Club Register of merit was not established until 1903, and hence not enough data from this association are available for comparisons. The Holstein Friesion Association established the "Advanced Registry Official" in 1894, and since that time 11815 cows and 835 bulls have been admitted. During the year ending May 15, 1910, 3070 cows were entered. For convenience of study these cattle were divided into four classes according to the possible kinds of mating, with the results shown in Table 1.

Table 1. Breeding of 3070 Holstein-Friesian Cows in Advanced Registry.

Description of parentage.	Number of A. R. O. Cows resulting from stated parentage.	Percentage each form of parentage bears to total.
Both sire and dam in Register	1196	39
Neither sire nor dam in Register	710	23
Sire in Register; dam not	770	25
Dam in Register; sire not	394	13
Total.....	3070	100

These results show that 39 per cent of the cows entered during the year have both sire and dam in the Register, 23 per cent have neither sire nor dam in the Register, 25 per cent have sire only and 13 per cent have dam only in the Register.

Now, there are many cows not in

the Advanced Registry that if tested, would make the requirements, which are very low when compared with high efficiency. There are also great variations among cows in the Register, some barely making the requirements, others attaining much higher efficiency. This suggests the question as to the percentage of high producing cows having Advanced Registry parents. The author further states that this is the real test of efficiency, since the minimum requirements for admission are not difficult to make.

Table 2. Breeding of 1,121 Holstein-Friesian Cows making 50% above requirements.

Description of parentage.	Number of A. R. O. Cows resulting from stated parentage.	Percentage each form of parentage bears to total.
Both sire and dam in Register	584	52
Neither sire nor dam in Register	157	15
Sire in Register; dam not	235	20
Dam in Register; sire not	145	13
Total.....	1,121	100

These figures show that as the requirements are raised the chances of getting an Advanced Register heifer from non-register parents are quite small.

Table 3. Breeding of 168 Holstein-Friesian Cows making 100% above requirements.

Description of parentage.	Number of A. R. O. Cows resulting from stated parentage.	Percentage each form of parentage bears to total.
Both sire and dam in Register	123	73
Neither sire nor dam in Register	5	3
Sire in Register; dam not	25	15
Dam in Register; sire not	15	9
Total.....	168	100

With the requirements doubled the chances of getting an Advanced Register heifer from the outside are only three out of a hundred, while the chances of getting one from Advanced Register parents are about three in four, and the writer comments thus: "It would seem that the time-worn expression, 'blood will tell,' has again proven its right to remain the breeders' watchword."

Another table gives data showing that if cows are wanted that can produce four or more daughters that can make the Register, the chances are about three to one that she will be found in the Advanced Register.

Holstein bulls are admitted to the Advanced Register when they have four or more daughters in the Register, and such bulls are spoken of as having so many daughters in the list. Out of 133 bulls admitted during the year ending May 15, 1910, 64 per cent have both sire and dam in the Register, while only 8 per cent have neither sire nor dam in the Register, 19 per cent have sire only and 9 per cent have dam only in the Register. This is pretty conclusive proof that if a bull is wanted prepotent enough to get four or more daughters in the list, the chances are vastly in favor of finding him with

both sire and dam in the Register.

As with cows the real test of efficiency is shown when the requirements are raised. There is a constant increase in the number of sires having Advanced Register parents, until the five sires having seventy-five each in the list are considered, and each one of these sires has both sire and dam in the Register. These figures are very significant, showing clearly the necessity of breeding from Advanced Registry animals, if a bull is wanted that can produce a large number of Advanced Register heifers.

These data are not intended to prove that because a cow is not in Advanced Register and is not from Advanced Register parents that she can not make the requirements. Far from it. As already stated there are many good cows not in the Register simply because they have never been tested, but which would make the requirements if given the opportunity. They are intended to show that the chances of getting Advanced Registry animals are much greater by breeding from parents already in the Register.

GERMAN FARMER'S CO-OPERATIVE BANKS.

By J. R. TITSWORTH, '13.

Sixty years ago Fredrick William Raiffeisen, burgomaster of Weyerbusch, devised a simple system of co-operative banking which not only revolutionized agriculture in Germany but in all of Europe.

By the middle of the 19th century the small farmer of Germany was entirely in the hands of the landlord. The winter of 1847-48 was very severe on the peasant farmers. Hundreds and hundreds of them were starving. From this extremity arose the Raiffeisen community banking system.

Raiffeisen first formed an association of his more prosperous neighbors. They assumed liability. They purchased cattle and supplies and distributed them to the poor peasant farmers. The farmers repaid the cost with reasonable interest in five yearly installments. This further developed into making loans. At first the people who were to be assisted formed no part of the association. The association was run entirely on the principle of love for one's neighbor. Raffeisen recognized the fact that it could not long continue under this plan and he thoroughly reorganized the system.

Upon reorganization it was made wholly a co-operative society which was registered. Its operations were to extend over a definite district. Each member must own at least one share, the price varying according to the economic conditions of the community. Each member had one vote and one only, no matter how many shares he owned. To encourage co-operation, shares could be purchased by making small payments.

The principal working capital of these banks is savings deposits, which are accepted from anyone whether a member or not. A small sum is first set aside to pay a small dividend of 3% to 4% to members. In addition to this a reserve fund, which is fixed by law, is set aside. Any additional profit is distributed annually by a decision of a general

assembly of the members to some work of common utility.

A community bank differs very much from an ordinary bank. It does not have an expensive building but is more likely to be found in the back room of some farm house. The only man in the bank is the accountant. He is the only person about the institution that receives any remuneration for his services. His business consists of taking in small deposits and cashing small checks. The important business such as granting loans, transfering money to the central bank, etc., is done by the directors who meet once a week. Not only do they have charge of the banking affairs but they buy supplies for the community, see to the transfer of land and livestock and act as a business agent for the community generally.

Central banks were then established to act as clearing houses for the communities. Thirty-seven of these central banks were established. The Prussian government then took a hand in it and established a large, central co-operative bank in Berlin. This brought the small community bank immediately in touch with the outer world.

The Bank of Prussia received from the government at first a capital of $1,250,000. This has been increased from time to time until at present the working capital is $18,750,000.

The stability of this bank is wonderful considering that it was managed entirely by farmers. In the sixty years of business five regular banks have failed to everyone of the co-operative banks. This system has been successful in Germany, Austria, and France, and is rapidly sweeping over all Europe. Whether this system or some modification of it should be adopted in the United States is worthy of serious consideration.

MULES.

By G. B. THACKSTON, '14.

The mule is now one of the most common of the domesticated animals of the United States. It is a hybrid, the result of the crossing of a jack and mare and its history dates far back, records of it being found in the Bible and also in the works of the old Roman writers, but they have been known in America a comparatively short time. The first Spanish jack to be brought to America was imported into Mexico in 1591, but George Washington was probably the first person to own mules in the United States, having received some as a gift. They are now found in nearly all parts of the world, especially in the South.

The mule is used mostly as a draft animal and should be large bodied and strong of bone. It is found to be of especial service in the warmer climates although quite a number are used in the Northern states. As compared with the horse, the mule is able to do more work in proportion to size, is surer of foot, easier kept in good condition, and it is claimed by some that the mule is immune to many diseases common to the horse.

Mules are divided into four classes according to their size and use. Mules in the first class are from 15 to 16 hands high and weigh from 1150 to 1350 pounds. To this class

belongs the "sugar" and "cotton" mule. The "sugar" mule is usually of the best quality although the "cotton" mule is very poorly graded. The "lumber" mule is very large, from 15 to 17 hands and as he is required to do much heavy work he is prized more for size than for quality. The general purpose mule as seen in all kinds of work, stands from 15 to 16½ hands high and weighs from 1000 to 1400 pounds. The "mine" mule is the smallest of all, being only from 10½ to 15 hands high.

For years the main mule producing section in the United States was in Kentucky and Tennessee. The product was a low, light mule of inferior quality but strong and able to do much work for its size. But in the last few years the market has been demanding a larger mule, more of a draft type, that is able to do lots of heavy work. Kentucky and Tennessee then had few or no draft mares and with their small saddle mares could not produce a mule that answered the requirements. But Missouri had draft mares and so stepped into the lead in producing mules of the highest quality. That state is now producing mules that are typical draft animals, able bodied, strong boned, with good conformation and plenty of energy and power to do almost any kind of work.

The prices of mules at the present time is very good. Since 1867, when the average price was $66, mules have steadily increased in value until about 1894, when they began to decline, getting as low as $41 in 1897. Since then the price has increased until now it is between $110 and $120.

Since 1905, there has been an enormous increase in mule production, especially in Missouri and Tennessee with Missouri in the lead. Although Mississippi and Georgia also have quite a number of mules most of them are brought from Tennessee and Missouri, those states producing very few themselves.

At the present time Missouri and Tennessee are the main mule producing states of the United States, with Missouri far ahead of Tennessee, both in numbers and in quality, as seen by the prevailing prices. There can be little doubt as to the cause of this. Tennessee will never rank with Missouri in mule production until the saddle mare is discarded as a mule producer and the draft mare used instead. Twenty-five per cent of the mares in Tennessee are too small and haven't the surplus energy to do any work while in foal or while suckling the colt. The Tennessee Experiment Station owns two grade draft mares weighing about 1700 pounds each. They produce a good colt nearly every year and there is hardly a day that they do not do a lot of the light work on and around the farm. The work they do more than pays for their keep leaving the colt as clear profit.

There is little or no more outlay for a team of draft mares than for saddle mares. A grade draft animal with plenty of bone and conformation is just as good for mule production as a pure bred, and may be bought for much less. A good team of grade draft mares will cost from $400 to $500, and until Tennessee realizes the fact that she must sell her saddle mares and buy draft animals she can never hope to take the lead from Missouri as a mule producing state.

RASPBERRIES.

By J. N. GILMORE, '15.

One of our most popular small fruits grown in Tennessee is the raspberry. Widely grown and much used it serves as a delicious article of food on many a table. Botanists will tell you it is related to the rose which blooms in our yards. The consumer who purchases these berries knows the kind of raspberries by their color, as red, black, yellow or purple.

To the grower there are but two types, the red raspberries and black raspberries, or "blackcaps." There is a set of varieties of the red raspberry group which produces purple fruit and another which produces yellow berries. There are many varieties of the groups of raspberries and any grower can select a variety best suited to his conditions. Plant breeders have greatly improved this plant until at the present time we have many very productive strains of superior quality.

The methods of propogation in this plant are extremely interesting, red raspberries sending shoots up from the lateral roots. These new plants may be dug when they become six inches in height and transplanted when weather conditions are favorable. When they are used in this stage they are termed "soft plants." Generally the plants are allowed to harden during the winter and may be dug for shipping purposes the next spring when they are known as hard plants. The latter method is regarded as the safer.

On the other hand the blackcaps propogate differently. The tip of a branch bends over and roots grow from it when a small amount of soil is placed over it. In this way many plants are formed and these may be dug and planted the next spring.

Red raspberries succeed best on a rich, deep, clay loam soil. There should be clean tillage crops grown two years before planting, as potatoes or soybeans to free the land, at least partially, from weeds. In planting, the rows should be six feet apart, with the plants two to three feet distant in the row. Trowels and hoes are used to set them on the small plantation, but where the area to be planted is large, the rows are laid off, the plants dropped leaning on the land side of the furrow, and after some dirt has been firmed about the roots the furrow is turned back, thus completing the planting operation.

Blackcaps will succeed on more soils than will the red raspberries. They do very well on clays, loams, and even gravelly soils. In forming a plantation the rows are eight feet apart, the plants being three feet distant. In many Northern states mulching must be done to protect the plants during the severe winters. We, in Tennessee have no need of putting straw or leaves on our raspberry field for few plants are ever winter killed.

One of the most important operations connected with raspberry culture is correct pruning. It is here that nearly all would-be growers fail. The red raspberry canes are generally pruned twice, once in late summer to remove old growth and to allow the young canes plenty of room, and again in winter to cut the row back to a height of 18 to 20 inches. Blackcaps are pruned first during the picking season, the tips being cut off the new shoots to induce the growth of many lateral

branches, thus assuring a heavy fruiting growth for the next season. The canes that have already acted as fruit-producers are removed during the fall or winter.

The harvesting is usually done by women and children. There are no large raspberry plantations in Tennessee and the persons living nearby the field do all the picking. Pint and quart cups are used, 24 to 64 pints making a crate and 24 quarts filling a common berry crate. Tickets or checks are given in return for every box of berries picked. These tickets are cashed at the end of the week.

Black raspberries can stand more shipment than red ones, therefore the red group is grown mostly near cities. The market-gardener then is the man to grow raspberries in Tennessee. He can easily do this in connection with the small vegetables. Few garden crops will give better returns per acre than raspberries. There is comparatively little danger in Tennessee from severe winters. The local markets are such that raspberries never sell for less than 10 cents per quart. Berries in good condition may be shipped to Kentucky or other markets not so far away. A few good varieties grown in Tennessee are, viz.: red raspberry, Loudon, Cuthbert, and Miller; black raspberry: Gregg and Early Ohio.

FORAGE CROPS FOR HOGS

By BOYD BROWN, '13

If a hog gets enough corn along with grass pasture in the summer he will be in good shape to fatten in the fall. The trouble with this method is its cost. Corn is worth money, even if there is plenty of it in the crib, and many cribs run low before the fall crops come in. If the hogs be turned out into the woods to shift for themselves, it will take more corn than ever to put any fat on their lean ribs when the time comes to fatten them. A more economical plan is to raise them during the summer on suitable pasture.

Hogs are not built like sheep to run over the hills getting a little grass here and there. Foraging must be made easy for short legs, and rich for their small stomachs, else they will hang around the barn squealing. It is possible to give them pasture the year round here.

At the station farm the hogs are grazing belly deep in clover, while alfalfa is brushing their sides, and it is only the tenth of April, after a hard winter. A little corn will go a long way with them now; and it is a treat to see them busy, their tails keeping time with their jaws. But clover will not last and neither will alfalfa. There are plenty of other things to take their place.

Suppose we begin with the fall litters. Barley, rye, wheat, rape and vetch will give them winter pasture. The alfalfa and clover, fall sown, will come on in April. The clover may be Red, Japan, or Alsike as best suits the land. Red for early pasturing, Japan and Alsike for later.

Following this, comes spring sown clover and rape. Then in the last half of June, the rye and wheat will be ripe and the hogs can gather it themselves. When the hot dry times come, sorghum will save the other pastures and peas sown in the corn fields will get them in fine shape to

fatten well. They can gather them after the corn is harvested.

Does this sound like too much land? The winter pastures can be put anywhere without interfering with other crops. The alfalfa field will give a fair yield of hay and cow peas are sown at the last working of the corn. One acre of sorghum will keep ten pigs 46 days. One acre of alfalfa carried eight hogs from March to November in Alabama.

It is not too late to begin this year. Sorghum, soybeans, cowpeas, may be planted and all will give pasturage and help make big hogs in prime shape to fatten. Soybean pasture will carry ten pigs to the acre for 34 days. Does it pay to make hogs shift for themselves or feed them corn when they can be kept growing on a few acres of good pasture?

MULCHES

By JAS. L. HERRON, '14.

A mulch is often thought of as simply a layer of some form of vegetable matter on the soil. There are various kinds of mulches, namely: Vegetable, dust, stone, canvas, and other objects which may be placed on the surface soil to check the evaporation of water. While a vegetative mulch is the most effective in preventing evaporation, it is too expensive for large areas, since a dust mulch is the most economical and is within the reach of everyone. A dust mulch is a finely pulverised surface soil. The fine particles of earth act as a check in preventing the evaporation of soil water, which otherwise would be lost in the atmosphere.

In an experiment carried on by the agronomy class at the University of Tennessee relative to the importance of mulches, two mulches were taken into consideration, namely, the dust mulch and a mulch consisting of leaves. For this purpose five metalic cans were used containing lateral tubes for the use of pouring in water. In this way the water finds its way through the pore spaces of the soil to the surface exactly as in natural field conditions. Can No. 1 was left compact. Can No. 2 was cultivated one inch deep. Can No. 3 was cultivated three inches deep. Can No. 4 was cultivated five inches. Can No. 5 consisted of a two-inch leaf mulch. The average daily evaporation was as follows: Can No. 1, 17.69 c.c.; No. 2, 16.53 c.c.; No. 3, 15.75 c.c.; No. 4, 13.56 c.c.; No. 5 12.01 c.c. It is readily seen that the leaf mulch has a decided advantage over the various depths of cultivated mulches. However, it cannot always be used. It is generally believed that a three-inch dust mulch will meet the demands better than greater depths of cultivation, for a deeper cultivation will disturb the roots of the plant.

It has been found that a compact clay loam during a period of 100 days would loose by evaporation, 21 inches of rainfall. A one-inch dust mulch would loose 11 inches. A two-inch dust mulch would loose 8 inches. A three-inch dust mulch would loose 7 inches and a two-inch leaf mulch would loose 4 inches. There are about 50 inches of rainfall during the year and by far the greater portion falls during the winter and spring, and this can be saved for later use of the plant in appreciable quantities by keeping a continuous dust mulch.

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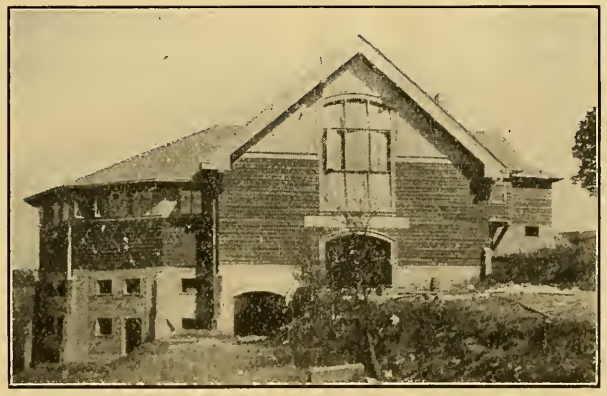
EDITORIAL.



O. P. Temple Hall.

The 39th annual meeting of the East Tennessee Farmer's Convention and Institute was held for the first time in the O. P. Temple Hall, built by the Convention and the Experiment Station Farm. This commodious building consists of a large auditorium, and offices above, and stalls for the exhibition of fine stock below. Besides being a building admirably suited to such a purpose, its location is splendid being as it is, situated right on the farm where the plats can be seen and where all kinds of farm implements may be displayed. Another novel feature this year was the lunches sold by the boys of the Agricultural Club of the University. Taking it all in all the convention was a decided success this year.

At the Experiment Station Farm, the cultivators are now busy, for now is the time and this is the way to conserve the moisture that the corn will need next month. The farmer who plows deep, keeps his soil well supplied with humus, and cultivates shallow and often has little cause to fear drought.

Along with cultivation of crops comes the harvesting of cereals and hay, making this month a very busy time on the farm, and fortunate is the farmer who has so planned his rotation that he is able to keep up with the work of this month without over working his horses and his men.

Vacation has begun here at the "Hill" and the attendant dispersal of students has occurred. Some have gone back to the home farms to harden the muscles that have become soft, some have merely changed from University students to Summer School students, and some have gone far from the Hill perhaps not soon to return. But wherever they are and whatever they may do we know that they will remember the University and if themselves unable to return, may they send others to take their places.

Almost any one who thinks about rural social conditions comes to the conclusion that they are as a rule not as attractive as in the cities, nor yet as attractive as they should be or might be. Why this is the case is apparent after a moments thought. The vital question is, how may improvements be made? Every rural citizen who is made of the right kind of stuff should be trying to help solve this question.

Here is a plan which came to our attention through the columns of the Wallace's Farmer. A club called the "Doings of the Jolly Dozen," was formed. This club consists of twelve families, and meets once each month at the home of one of them. In this way each family entertains the remaining eleven once each year and in turn is entertained eleven times by picnics, parties, games, Halloween parties, New Year parties or what ever may be appropriate for each month. The whole family goes and it seems like a jolly good plan to bring the community into closer relations and to develop the social life of the country. What a wonderful change might be wrought if there were Jolly Dozen clubs meeting on bright moonlight nights, in the thousands of communities all over the United States!

THE INGLESIDE JERSEY SALE.

On May 8th, the final dispersion sale of Jerseys was held at Ingleside Jersey Farm, Athens, Tenn. Mr. W. Gettys, the veteran breeder, offered about 80 head of Jerseys, composed of a lot of young cattle of very fine type. There were only 20 cows in the offering which had calved. The 80 head brought an average of about $200 each, which was a very good price considering that the offering were so young. Tennessee is to be congratulated upon the fact that most of this fine lot of Jerseys remain in the state. Mr. G. W. Callahan and Mr. H. H. Galbraith were among the heaviest buyers. Mr. Galbraith secured an exceptionally fine lot of milking heifers.

HINTS FOR THE GARDEN.

Don't get the habit of neglecting the farm garden.

Make your plans at night for the following day's work.

Don't allow a single weed to grow in that kitchen garden.

Plant sweet corn every too weeks for rotation, also radishes.

As fast as one crop matures take it off the ground and seed another.

Get capable men to pick your fruit because bruised fruit soon becomes worthless, especially peaches.

Watch the tomatoes and keep all of the suckers pinched off. Do not allow them to become large before doing this.

Of course you do not expect your women folks to keep the garden hoed, but some of your neighbors do much to the sorrow of both.

Keep the cultivators running in order to keep a dust mulch over the soil. During these hot days the soil soon dries out and the plants suffer.

Look out for the morning glories and crab grass. This is the month they start and if once they get a foothold in rich soil the work of cultivation is greatly increased.

After picking the strawberries the patch should be thoroughly cleaned out and the rows thinned and cultivated during the summer and not used as a crab grass meadow.

If grapevines are tied up or pruned in such a way as to admit free circulation of air and are then sprayed and bagged the bunches will be much prettier and will not rot.

Never wait until weeds have taken possession of the garden and then attempt to hoe them out. It is time wasted. It would better to turn them under and plant something else in rows far enough apart for horse cultivation.

PERSONAL MENTION.

Dr. Jacob spent a few days at Memphis.

On the 4th of May, the Juniors tendered to the Seniors a dance at Whittle's Springs.

Professor Morgan delivered the address to the graduating class of Knox County Central High School.

Mr. C. A. Hutton spent several days at Columbia about the middle of the month, testing cows for Advanced Registry.

The Senior Ags and the Farm Club were very delightfully entertained at the home of Professor Morgan on the evening of the 15th.

Professor Morgan spent about a week at the West Tennessee Experiment Station, Jackson, and also a few days at the Lespedeza Farm, Hickory Valley, returning May 5th.

Professor Morgan, Professor Willson and a number of the agricultural students attended the Gettys' sale at Athens. From here Professor Morgan went to Fayetteville for the closing exercises of the Mimosa High School. Mr. Judd Brooks also visited Fayetteville.

Professor Keffer entertained his Senior Class at the Country Club on the afternoon and evening of the 16th.

On the 17th and 18th there was held the First Annual Interscholastic Meet at the University of Tennessee. 107 delegates were sent from 17 high schools and were ac-

companied by many of their friends. The features of the occasion were ball games, field day sports, an oratorical contest and on the evening of the last day there was the three ring circus followed by the Coronation Ball at which was crowned the Queen of the Jubilee. Castle Heights School won greatest number of points in the field day points. The Oratorical Contest was won by Mr Jesse A. Benton, of the University of Chattanooga. Miss Alice Porter of the University was crowned Queen of the Jubilee at the Coronation Ball.

ALUMNI NOTES.

As June is the anniversary of so many as Alumni of the College of Agriculture, it seems fitting at this time to enquire into how some of them have spent the last year and where they may be.

Andrew Jackson, '10, is running a small farm near Knoxville.

A. Perry, '10, is engaged in farming with his father at Spring Hill, Tennessee.

Jno. F. Farrow, '10, after teaching in Soddy High School a year, is now farming near Alamo, Tennessee.

On 1066 North Seventh Street, Memphis, Tennessee, W. C. Johnson, '11, is in the floral business with his father.

J. F. Voorhees, '09, Observer, United States Weather Bureau, in charge Knoxville Station and instructor in Meteorology.

J. E. Hite, '04, former professor in the Georgia Agricultural College is now engaged in farming at his old home, Gallatin, Tennessee.

Former instructor in dairying at the University of Georgia, R. M. Murphy, '10, is now engaged in dairy farming near Fountain City, Tennessee.

W. M. Landis, '10, formerly connected with the extension department of Georgia Agricultural College is now farming at Fayetteville, Tenn.

After teaching Agriculture in the Tyner High School for two years, A. W. Shofner, '09, has married and has gone into practical Agriculture on his farm near Normandy, Tennessee.

Our former professor of Agronony, C. H. Lane, '09, is now doing Agricultural extension work with the United States Department of Agriculture, Washington, D. C.

L. R. Neel, '07, is editor of the Southern Agriculturist over at the Capital City. He is also connected with the Experiment Station doing co-operative work in Middle Tennessee.

D. C. Parman, '11, who is stationed at Dallas, Texas, Box 208, is doing work in the Southern Field Crop Insect Inspection Department with the United States Bureau of Entomology.

The West Tennessee Normal School is very fortunate in getting Professor U. S. Bright, '07, and former teacher in the Paris High School and others to take charge of its Agricultural Department.

It is gratifying to all to know of the great success of G. R. Worthington, '10, who has been in charge of the Agronomy Department of the Lespedeza Stock Farm, Hickory Valley, Tennessee, since 1911.

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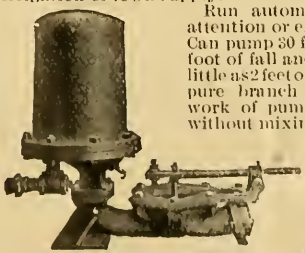

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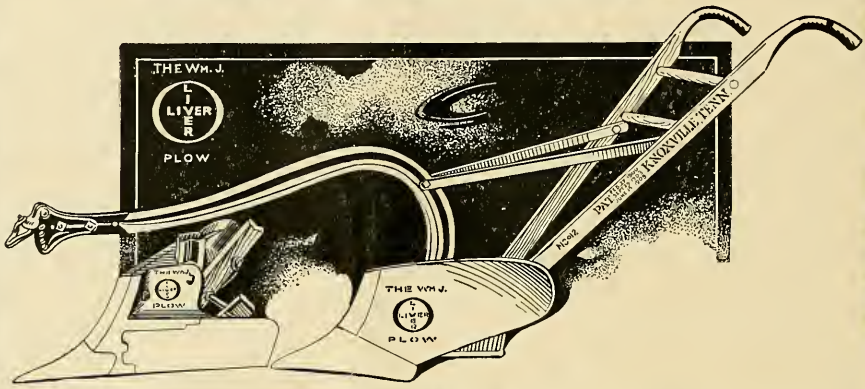

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